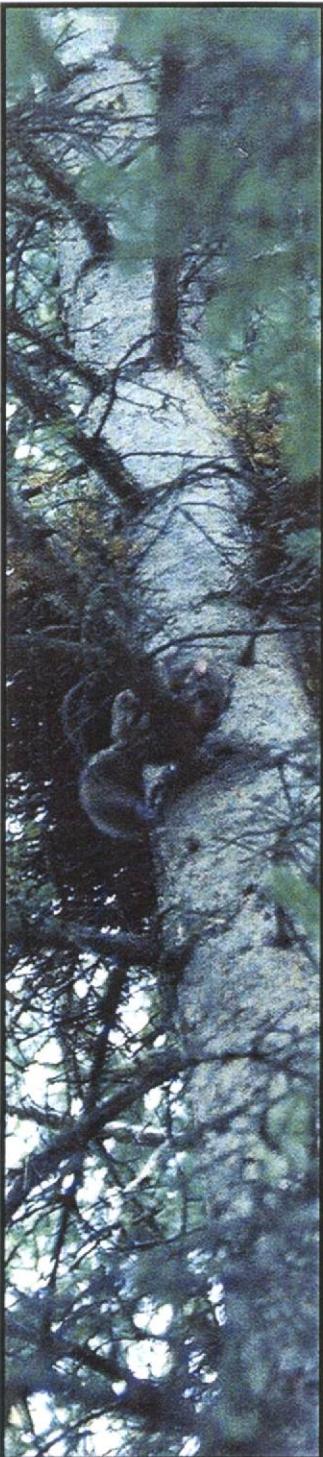


**Distribution and Habitat Association of Flying Squirrels in the
Northern Black Hills**

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Spearfish, South Dakota**



**Distribution and Habitat
Associations of Northern Flying
Squirrels in the Northern Black
Hills of South Dakota**

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Abstract

This study investigated the occurrence and distribution of northern flying squirrels (*Glaucomys sabrinus*) in the northern Black Hills of South Dakota. Live-trapping and incidental observations at 13 sites showed that the species is found across the study area in locations forested with ponderosa pine, quaking aspen, or a mix of these species and white spruce. In mid- to late summer and early fall, flying squirrels were captured at every site studied. None were captured in spring or early summer, possibly due to availability of food or habits while young are confined to the nest. Flying squirrels occurred in forest with no recent disturbance, areas harvested historically, and those moderately thinned within the past 20 years. Presence was not affected by distance to water or size or density of snags in the immediate vicinity.

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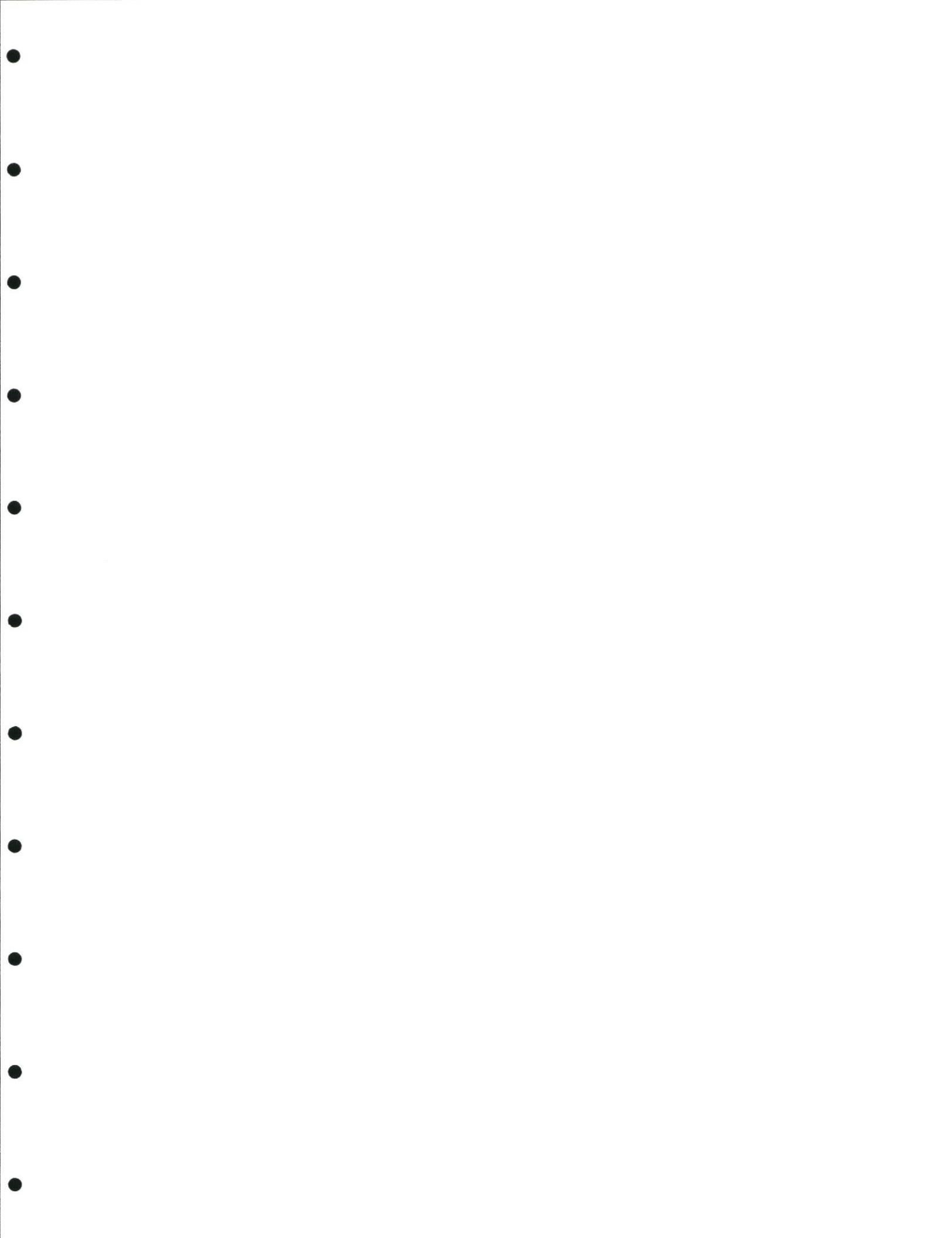
Conversion Factors

Miles = km / 1.6

Feet = m * 3.28

Inches = cm / 2.54

Fahrenheit = (C * 9 / 5) + 32



Introduction

In South Dakota, northern flying squirrels (*Glaucomys sabrinus bangsi* Rhoads) are found only in the Black Hills (Higgins et al. 2000). The nearest known populations of this nocturnal, arboreal rodent are 395 km west in Wyoming (Turner 1974) and 580 km northeast in North Dakota (Jones et al. 1983), indicating that the Black Hills population is disjunct. Flying squirrels are not known to occur in the Bighorn Mountains (USDA Forest Service 2003), located approximately 200 km west between the Black Hills and the nearest Wyoming populations, though the Bighorns are forested and appear to contain suitable habitat.

Northern flying squirrels are ranked as S2 in South Dakota, indicating that the species is imperiled because of its isolation in the Black Hills (South Dakota Game, Fish and Parks Department 2002). The *bangsi* subspecies is also found in the Wyoming portion of the Black Hills and Bearlodge Mountains, western Wyoming, Idaho, Montana, and northeastern Oregon (Wells-Gosling and Heaney 1984).

Northern flying squirrels have rarely been studied in the Black Hills. There is little detailed information on habitat preferences or distribution. Turner describes general characteristics of flying squirrel habitat, and, along with Over and Churchill (1941), states that flying squirrels are more common than generally thought due to nocturnal habits, but there are no data to support this conclusion in the study area. In 2001, a study conducted at Wind Cave National Park in the southern Black Hills provided the first information on population and home range size (Duckwitz 2001).

Flying squirrels are known to feed on ectomycorrhizal fungi and may be instrumental in dispersal of spores (Waters et al. 2000). These fungi “play a vital role in nutrient cycling, plant succession, and productivity in ecosystems” (Maser et al. 1986). The relationships among flying squirrels, fungi, and Black Hills forest ecosystems, and the effects of forest management on these relationships, are not known.

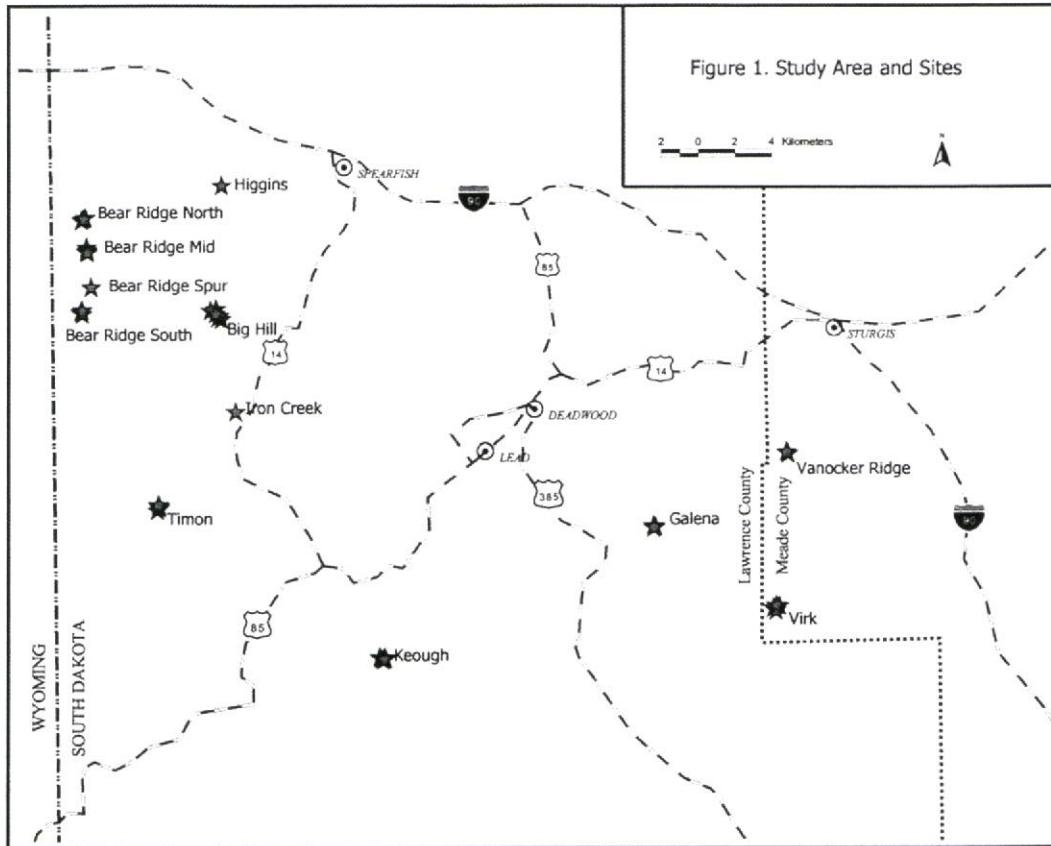
Most of the Black Hills is managed by the USDA Forest Service. The revised Land and Resource Management Plan for the Black Hills National Forest assumes that flying squirrels are associated primarily with white spruce (*Picea glauca*) but that mature ponderosa pine (*Pinus ponderosa*) stands “with spruce as a subdominant component...should be capable of supporting flying squirrels” (USDA Forest Service 1996, p. III-332).

To obtain data on flying squirrel habitat associations and distribution in the northern Black Hills, we assessed presence at sites representing a variety of habitat conditions and locations. We also recorded incidental observations of flying squirrels.

Study Area and Methods

The study area was located in the northern end of the Black Hills and was roughly 40 km east to west by 24 km north to south (Figure 1). The majority of the study area is managed by the U.S. Forest Service. Twelve study sites were scattered within the study area; all were forested. Sites ranged in elevation from 1219 to 1770 m and were in the Central Core and Limestone Plateau geomorphological regions (Larson and Johnson 1999). Annual precipitation ranges from approximately 56 cm at the lower-elevation sites to 66 cm near the

Keough Draw site; on average, one-third of the annual precipitation occurs during May and June (Driscoll et al. 2000). Site maps are located in Appendix A.



Our main method of assessing species presence was live-trapping using Tomahawk #201 traps (40.6 x 12.7 x 12.7 cm). Trapping periods ran from May 27 to August 22, 2002, and April 27 to September 27, 2003. In both years, no trapping took place during most of July.

We began by selecting sites that appeared to have a high potential for flying squirrel use as gathered from the literature – presence of large-diameter trees, white spruce, dense canopy, and snags with cavities. We placed up to 12 traps per site, generally with a pair of traps at each trapping point. Trap pairs were separated by 15 to 100 m. At most points, one trap was placed on the ground and the other 1 to 2 m above the ground in a tree. The preferred location for the elevated trap was a solid, horizontal branch, but often this was not available due to the growth form of ponderosa pine and white spruce in dense stands; in these cases we placed the trap on a log or the leaning trunk of a partially fallen tree. To increase trap stability we secured each with wire and, in 2003, light-weight chains.

Initially we baited the traps using peanuts and a mixture of oats, peanut butter, and molasses. In July 2002 we added oil-packed tuna. To allow squirrels time to find and become accustomed to the traps, we baited and locked open the traps the evening that we placed

them. One to several days later we replaced the bait. If the bait had disappeared by the third visit, we set the traps just before or after dusk and checked them early the following morning. If the bait was still intact, we left the trap open for another few days. When a squirrel was captured we photographed and immediately released it, and usually ceased trapping efforts at the site.

We recorded landform, vegetation, and other characteristics of each site.

Results

Distribution

We caught 16 flying squirrels at 6 study sites (Table 1) and observed a flying squirrel at one additional site. Sites represented most of the study area, separated by a maximum of 25 km north to south and 30.5 km east to west (Figure 2). The eastern edge of the study area was not represented; trapping was attempted but could not be completed due to severe weather and unexpected timber harvest.

Table 1. Trap sites and dates

Site	Dates of trapping	Date/s of capture	Number of flying squirrels caught
Bear Ridge Mid	June 11-June 26, 2002		
Bear Ridge North	July 21-July 30, 2002	July 30, 2002	1
Bear Ridge South	June 7-June 26, 2002		
Big Hill Aspen	Aug. 4-Aug. 10, 2002 May 12-May 29, 2003	Aug. 10, 2002	5
Big Hill Pine	Aug. 11-Aug. 22, 2002	Aug. 22, 2002	2
Galena	May 27-June 1, 2003 July 30-Aug. 3, 2003	Aug. 3, 2003	1
Iron Creek	May 2-June 1, 2002		
Keough Draw	May 27-June 1, 2002 Sept. 14-Sept. 23, 2003	Sept. 23, 2003	4
Timon	May 13-June 1, 2003 Aug. 23-Sept. 7, 2003	Sept. 1 & 7, 2003	3
Vanocker Ridge	May 17-27, 2003		
Virk	Apr. 27-May 13, 2003		

The incidental observation was in Higgins Gulch. The sighting was at approximately 1219 m and was on a ridgeline in dry pine forest.

Based on size, we estimated that 11 of the 16 flying squirrels captured were adults and the remainder juveniles. Trapping on a cool night in September resulted in mortality of one adult and one juvenile. Squirrels otherwise seemed healthy when released and made a rapid escape, usually by ascending a nearby tree and either remaining motionless until we departed or gliding to a more distant tree.

On the same night we caught two other flying squirrels in traps about 100 m from the traps where the mortality occurred. Low temperature (1° C) was the same at the two sites. The mortality occurred in a trap located on a pine branch about 2 m above the ground. The tree was adjacent to a roughly 10-by-10 m opening and there was little forest canopy above the trap to slow heat loss. The traps in which the healthy squirrels were caught were in and

under a brushy spruce tree, where heat loss would have been less. The lively condition of these squirrels, however, leads us to believe that they were not in the traps long. Presumably they were caught during the pre-dawn foraging period (Wells-Gosling and Heaney 1984), while the others may have been caught the previous night, not long after dark.

Habitat Associations

Species presence was confirmed in a range of site conditions. The lowest site was at 1219 m and the highest at 1770 m. Slopes ranged from nearly flat to 45%. Two sites were within 150 m of a perennial water source, while others were several hundred meters from water. Two study sites were forested exclusively with ponderosa pine; others included a variety of tree species, but none was dominated by white spruce. Table 2 displays several characteristics of successful trapping sites.

Table 2. Characteristics of successful trapping sites

Site	Elevation	Aspect	Slope	Vegetation community type ¹	Distance to water
Bear Ridge North	1399 m	E	35%	Ponderosa pine/little bluestem	> 800 m
Big Hill Aspen	1650 m	S, SE, N	5-10%	Aspen/bracken fern	480 m
Big Hill Pine	1654 m	SW	10%	Ponderosa pine/bearberry	800 m
Galena	1600 m	NE	10%	Ponderosa pine/common juniper, white spruce/twinflower, aspen/beaked hazel	50-100 m
Keough	1770 m	WSW	30%	White spruce/grouseberry, ponderosa pine/common juniper	150 m
Timon	1730 m	NW/SW	35-45%	Ponderosa pine/common juniper, white spruce alluvial Black Hills forest, aspen/spiraea	300 m

¹Marriott et al. 1999

Sites are described in more detail below.

Bear Ridge North



Figure 1. Bear Ridge North (site B)

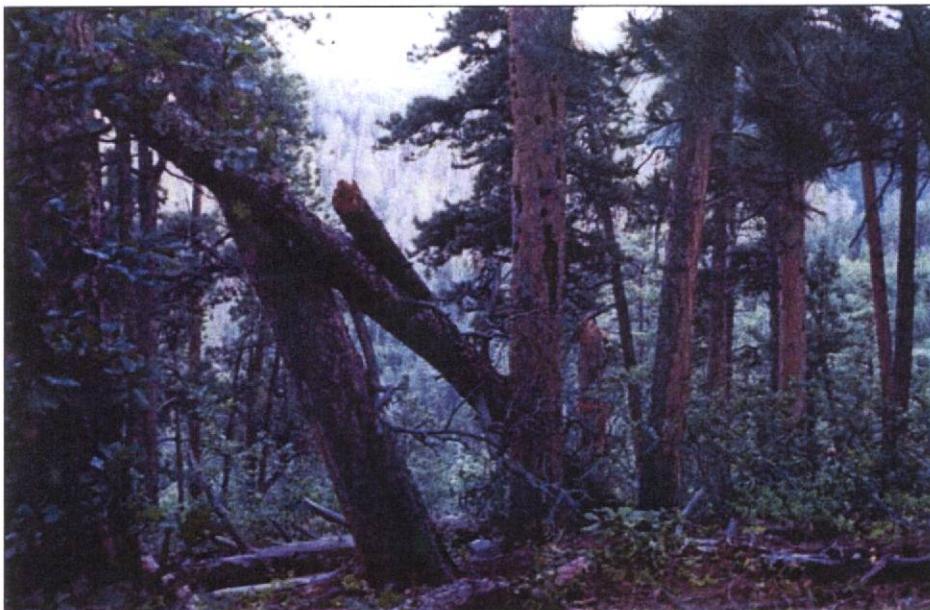


Figure 2. Bear Ridge North (site A)

Bear Ridge North is the lowest and driest study site, located within 2 km of the prairie surrounding the Black Hills. There are few signs of management and only very old fire scars. The forest consists of ponderosa pine 25 to 50 cm in diameter over patches of pine saplings and bur oak (*Quercus macrocarpa*) brush. Pine snags 38 to 50 cm in diameter are

found in all stages of decay. Forest structure is patchy due to topography and pockets of wind or pathogen damage.

Big Hill Aspen

This site is near the Big Hill trailhead and a heavily used gravel road. Vegetation is a patchy, diverse mix of mature and sapling quaking aspen (*Populus tremuloides*), grassy openings, and scattered pine. There are few large-diameter pine snags but many cavities in both live

and dead aspen. A wide variety of understory vegetation exists, including bracken fern (*Pteridium aquilinum*), juneberry (*Amelanchier alnifolia*), snowberry (*Symphoricarpos albus*), and bearberry (*Arctostaphylos uva-ursi*). We found no signs of past fire. Much of the mature pine was cut in the early 1990s, and cattle graze the area.

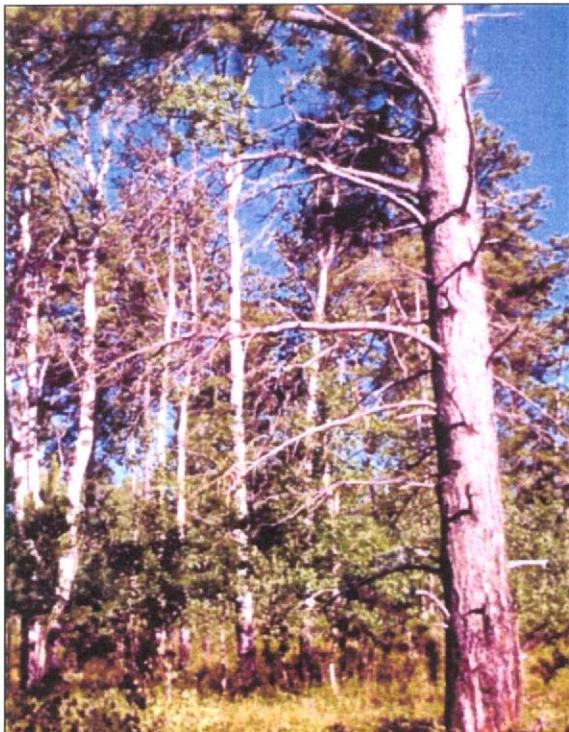


Figure 3. Big Hill Aspen (site A)

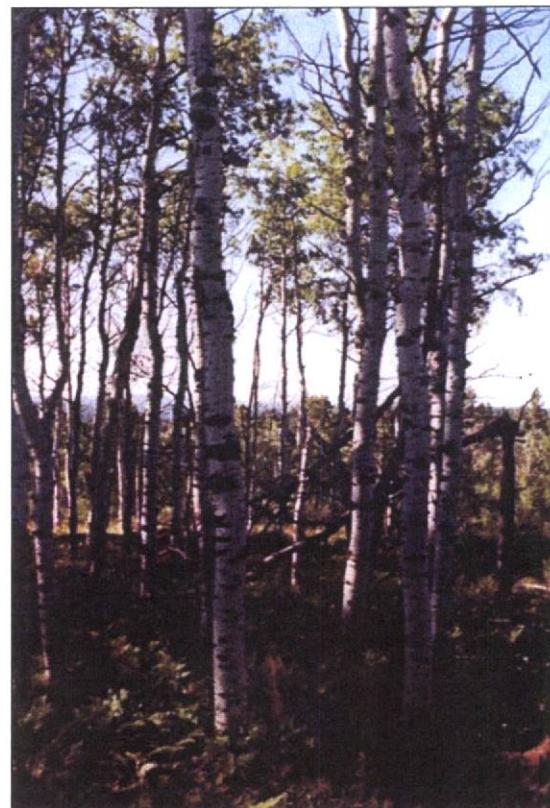


Figure 4. Big Hill Aspen (site C)

Big Hill Pine

This site is adjacent to Big Hill Aspen but is dominated by ponderosa pine. Tree diameters are small to moderate (12 to 33 cm). The ground is thickly covered with pine needles; sparse understory vegetation includes common juniper (*Juniperus communis*), chokecherry (*Prunus virginiana*), and bearberry. Snags are generally of small diameter and relatively infrequent. Slash from light thinning conducted in the early 1990s is found in some areas. We found no signs of past fire.



Figure 5. Big Hill Pine (site C)



Figure 6. Big Hill Pine (site B)

Galena

This damp, northeast-facing site is densely forested with white spruce, quaking aspen, and paper birch (*Betula papyrifera*). Ponderosa pine exists as scattered live and dead remnants, the largest of which is a live tree 32 inches in diameter and 90 feet tall. The site is nearly undisturbed. Some of the patches of aspen are decadent and include many cavities. A small perennial stream flows at the edge of the stand. Spruce saplings, common juniper, and bearberry dominate the understory. Ground cover consists of mosses, various lichens (especially *Peltigera* and *Cladonia* spp.), fallen leaves, and large amounts of woody debris in all stages of decay.

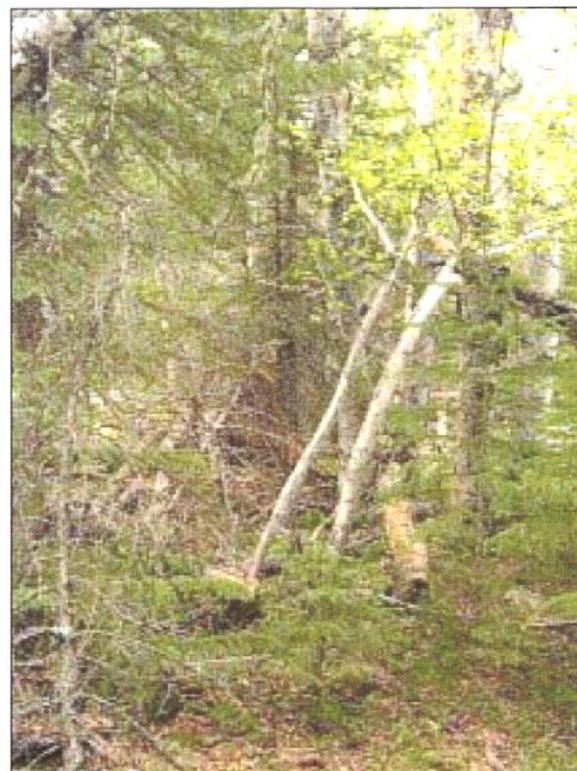


Figure 7. Galena (site B)



Figure 8. Galena (site A)

Keough Draw



Figure 9. Keough Draw (site E)

Keough Draw is the highest site in the study area and includes a white spruce/grouseberry (*Vaccinium scoparium*) vegetation community, rare in the Black Hills (Marriott et al. 1999). Dense spruce forest is found along the perennial stream and on adjacent slopes, becoming mixed with ponderosa pine and quaking aspen further from the draw bottom. Small openings exist where mountain pine beetle infestation has killed groups of 5-15 trees each. Snags are patchy and mostly of small diameter. As shown by height and condition of stumps, sites where flying squirrels were captured appear last to have been harvested in the horse-logging days of the early 20th century and burned shortly thereafter. We did not capture flying squirrels in the pure spruce forest. Unusual species observed at the site include fairy slipper orchid (*Calypso bulbosa*) and *Oreohelix strigosa* subspp. land snails.



Figure 10. Keough Draw (site D)

Timon

The Timon site has a diverse mix of tree species, community types, aspects, slopes, and site moisture. Two trap locations were dominated by white spruce and scattered older pine (Figure 11). Two were in a dry pine stand (Figure 12) and the last was on a mesic slope forested with spruce and paper birch. Trap sites were within 400 m of a campground and trailhead, and one site was within 100 m of a foot trail. Successful trapping sites were at the intersection of the spruce and dry pine types and on the dry pine slope.

Understory vegetation consisted of common juniper, russet buffaloberry (*Shepherdia canadensis*), mosses, and lichens. *Usnia* spp. lichen (probably *Usnia cavernosa*) was common, especially in spruce trees. Little Spearfish Creek, adjacent to the site, includes a diverse, fairly intact riparian area and wet meadows. We observed a high diversity of bird species at this site. There are no signs of recent timber harvest, and only very old fire scars.



Figure 11. Timon (site B)



Figure 12. Timon (site D)

Other Findings

Trap Placement

Twelve of the sixteen squirrels were captured in elevated traps, though overall more than half the traps were placed on the ground. Some of the elevated traps in which squirrels were caught were no more than 1 m above the ground, and many were not especially steady. Wells-Gosling (1985) states that elevating traps may not be necessary since squirrels readily enter traps on the ground, but most other studies have placed traps both on the ground and in trees (Duckwitz 2001, Carey 1991, Maser et al. 1986, Rosenberg and Anthony 1992, Waters and Zabel 1995).

Influence of Weather

We recorded minimum temperature at the study sites on most trap nights. Low temperatures on nights when flying squirrels were captured ranged from 1°C to nearly 21°C. As discussed above, when we trapped in mid-summer to early fall after a few days of habituation, temperature seemed to have no influence on success. To reduce chances of mortality, we did not set traps when rain was predicted. Most trapping nights, and all successful trapping nights, had light winds.

Use of Snags

On four occasions we observed flying squirrels using snags. Upon release, the squirrel we captured at Big Hill North jumped to a pine snag 34.3 cm in diameter by 3.5 m tall (Appendix B, Figure 8). The snag was old and gray with numerous cavities, one of which the squirrel entered. At Big Hill Aspen, one of the released squirrels entered a cavity in a dead aspen tree about 20 cm in diameter. At Galena, the squirrel we captured climbed a dead, very rotten aspen broken off about 4 m up and entered a cavity at the very top. And at Higgins Gulch, Scott Weins caused a flying squirrel to leave a cavity in a pine snag 23 cm in diameter by 10 m tall by knocking on the tree. Other reports of snag use include a squirrel leaving a very rotten pine snag inadvertently pushed over, and one leaving a cavity in a live aspen tree being cut (Appendix G). In general, the cavities we observed flying squirrels using were in relatively fragile snags of moderate diameter with a majority of soft, rotten wood. We did not observe use of drays.

Other Species Captured

In addition to flying squirrels, we captured individuals of the following species:

Common name	Latin name	Date	Site
Red squirrel	<i>Tamiasciurus hudsonicus</i>	July 29, 2002	Bear Ridge North
		July 30, 2002	Bear Ridge North
Long-tailed vole Gray jay	<i>Microtus longicaudus</i> <i>Perisoreus canadensis</i>	May 29, 2003	Big Hill Aspen
		Aug. 3, 2003 May 3, 2003	Galena Virk

On June 1, 2002, we found one of our traps at the Iron Creek study site with its rear door bent and forced partly open, trigger wire severely bent, and what appeared to be blood stains (Appendix B, Figure 22). We were not able to determine whether a larger animal had been

caught and forced its way out or found a squirrel or other small animal in the trap and removed it.

Least chipmunks (*Tamias minimus*) would enter and trip the traps, but could then exit through the trap mesh (1.27 x 2.54 cm spacing). They tended to eat only the peanuts. Other species would eat all of the bait.

Other Species Observed

Other species observed are listed by site in Appendix C. We observed the greatest diversity of other species at the Big Hill Aspen and Timon sites, where we also caught several flying squirrels.

At the Bear Ridge Mid site we observed brown creepers (*Certhia americana*), listed by the state of South Dakota as S3 (very rare or local, or found locally in a restricted range). At Keough Draw we found fairy slipper orchid (*Calypso bulbosa*), also listed as S3, and *Oreohelix strigosa* subsp. land snails; the Cooper's Rocky Mountain snail subspecies (*O. s. cooperi*) is listed as S2 and G5T1 (secure globally but subspecies critically imperiled).

Discussion

Our data show that flying squirrels inhabit the northern Black Hills across at least 551 m of elevation, in both dry and moist habitats, and in a variety of forest types common across the study area. The species is found at dry upland sites forested with pine or mixed pine and aspen as well as at more mesic sites forested with pine, aspen, spruce, and birch.

While spruce was a component of the forest at four of the sites where squirrels were captured, it was absent from the other two sites and was not the dominant overstory species at any site. Spruce dominated the understory at Galena and parts of Keough Draw and Timon; although we set traps in these spruce-dominated microsites at all three locations, we captured squirrels only at the Keough Draw microsite. We set traps in the part of Keough Draw forested exclusively with spruce but captured no squirrels. Thus, the assumption that flying squirrels in the Black Hills are most likely to be found in spruce stands or pine forest with a large amount of spruce understory may not be valid. Our data show that they may be associated to at least an equal degree with aspen and pine forests.

Other factors that did not seem to influence flying squirrel presence include distance from water, slope, aspect, perceived gliding obstructions such as snowbent pine saplings or interlocking spruce branches, number or size of snags in the immediate vicinity, canopy cover, or average tree diameter.

Though we documented flying squirrel presence in certain habitat types, lack of capture data does not support the conclusion that flying squirrels are absent from other sites. We attempted to trap squirrels at five additional sites, all of which we studied in May or June. These sites included features that we expected to indicate a high potential for flying squirrel use. We were unable to capture flying squirrels at several of these sites in 2002, and initially ascribed this to species absence. In 2003, however, we had the same experience at other sites we studied in spring and early summer, and at one of the sites at which we caught several flying squirrels in August 2002. In total, there were three sites at which we were not able to catch squirrels in early summer but did after mid-July. This suggests that flying squirrels are not amenable to trapping in spring and early summer. Possible explanations may include:

1. Female squirrels with litters may be particularly cautious and secretive while the young are still confined to the nest (Wells-Gosling 1985). In other locations, northern flying squirrel pups are born in late May through June and begin to emerge from the nest at around 40 days of age (Wells-Gosling and Heaney 1984). Females leave the nest for only short periods during the pups' first few weeks, but foraging trips become longer as demands for food increase. If this pattern holds true in the Black Hills, female flying squirrels with young would spend increasingly longer periods foraging as summer progresses, and may also become less wary and reluctant to enter traps.
2. Preferred foods may be abundant in spring and early summer, reducing flying squirrels' interest in bait. Wells-Gosling (1985) noted that southern flying squirrels often abandon feeders during this period in favor of native foods. Food preferences of flying squirrels have not been established in the Black Hills, although in mid to late summer they readily consumed the bait we provided. Lichens and fungi, especially hypogeous sporocarps of ectomycorrhizal fungi, are known to be major food sources in other locations, and food habits of northern flying squirrels are thought to be similar over widely separated areas (Maser et al. 1985). Little is known about fruiting season of ectomycorrhizal fungi in the Black Hills (Gable pers. comm. 2004). In southwestern Oregon, highest truffle production was in August (Amaranthus et al. 1994); in northeastern Oregon, hypogeous fungi are the principal food of flying squirrels from July to December (Maser et al. 1986); Fogel (1976) reports that seasonal abundance of hypogeous fungi generally follows changes in temperature and precipitation. It is known that mushrooms and other fleshy fungi are most available in the Black Hills in late summer and early fall after a rain (Gable 2000).

Our experience may not be unique. In Wind Cave National Park at the south end of the Black Hills, Duckwitz (2001) started trapping in May and had some success around the end of the month but found peak activity to occur in late June and early July (Kiesow pers. comm. 2004). Crompton (1994) trapped small mammals in the northwestern Black Hills using similar methods (though all traps were on the ground) from July 1 to August 15, 1992, and captured no flying squirrels.

We originally theorized that flying squirrels may compete for habitat with red squirrels. Both flying squirrels and red squirrels use tree cavities and drays for dens (Wells-Gosling 1985, Higgins et al. 2000). Flying squirrels were documented using both drays and tree cavities at Wind Cave (Duckwitz 2001); we saw flying squirrels using only cavities. Because snags can be uncommon in some managed forests, we felt there could be a shortage of snags with suitable cavities. Because red squirrels are aggressive and flying squirrels tend to be retiring, we presumed red squirrels would displace flying squirrels in cases of conflict; Wells-Gosling (1985) reported red squirrels evicting southern flying squirrels (*Glaucomys volans*) from dens, and southern flying squirrels are known to displace northern (Weigl 1978). Competition for food, on the other hand, did not seem likely, because red squirrels depend primarily on seeds and studies of northern flying squirrel food habits have shown little consumption of seeds (Maser et al. 1986). At all sites where we found flying squirrels, we also found red squirrels. The red squirrels may have been using slightly different parts of the sites; at Timon, for example, red squirrels were busily collecting spruce cones every morning, while we caught flying squirrels in the areas not dominated by spruce. We did capture flying squirrels in or on the edge of spruce-dominated areas at Galena, Keough Draw,

and Timon. Without data on populations or den use it is not possible to determine the effect of red squirrels on flying squirrel site occupancy, but we are able to conclude that red squirrel use of a site does not necessarily preclude flying squirrel presence.

Past Management of Habitat

Most of the forest in the Black Hills is actively managed by the U.S. Forest Service. Effects of these activities on northern flying squirrels in the Black Hills are not known. Timber harvest had taken place within the last 20 years at two of the six sites at which we captured flying squirrels: Big Hill Aspen, where much of the mature pine was selectively cut and several small aspen patches were clearcut, and Big Hill Pine, where small to moderate size pine were thinned. Because flying squirrels are using these sites now, we can conclude that timber harvest did not cause habitat at these sites to become completely unsuitable, at least in the longer term. Parts of the Keough Draw site were cut many decades ago, and subsequent regrowth has obviously provided habitat for flying squirrels. We are aware of no data from more recently, intensively managed sites. In other locations, studies of the effects of timber harvest on flying squirrel population density suggest that at least intensive timber management may reduce population density; though Rosenberg and Anthony (1992) found population density similar in old growth and second-growth forests, Waters and Zabel (1995) found it to be lower in heavily logged sites, and Carey (2000) reports that flying squirrel abundance is lowest in stands intensively managed for timber, higher in stands managed for legacy retention, and highest in old growth.

Conclusions

Northern flying squirrels are found across much of the northern Black Hills in a variety of forest habitats. The species is not restricted to forest including or dominated by white spruce, but is at least as readily found in aspen and pine. Key questions requiring further study include population density in various habitats and the effects of forest management on population density. Study of food habits could provide useful information on flying squirrels' role in pine-associated mycorrhizal function and ponderosa pine ecology in the Black Hills. Tests to determine the extent of genetic variation from other flying squirrel populations should be undertaken due to the Black Hills population's geographic isolation.

Acknowledgements

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Appendix A

Survey Site Maps

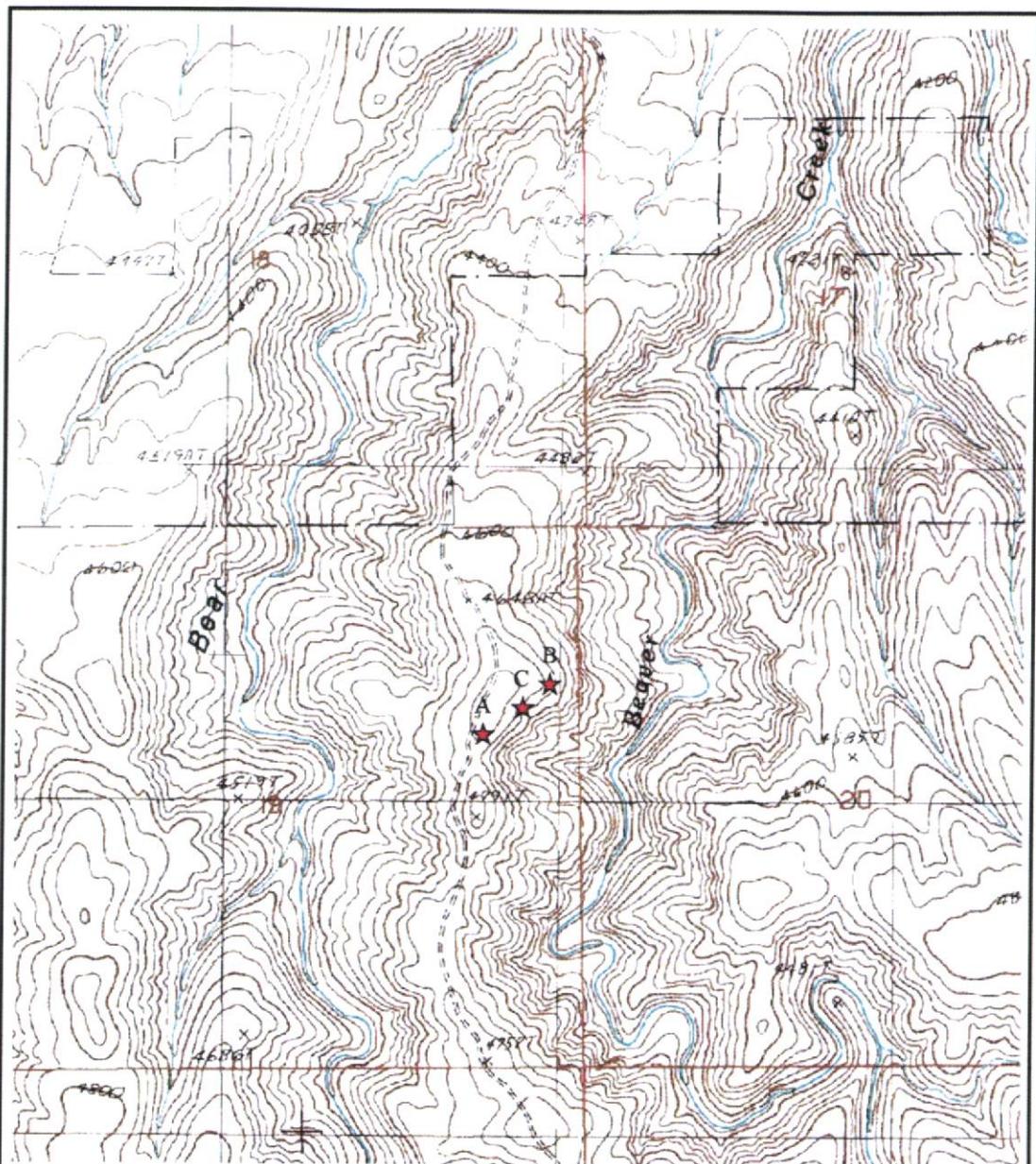
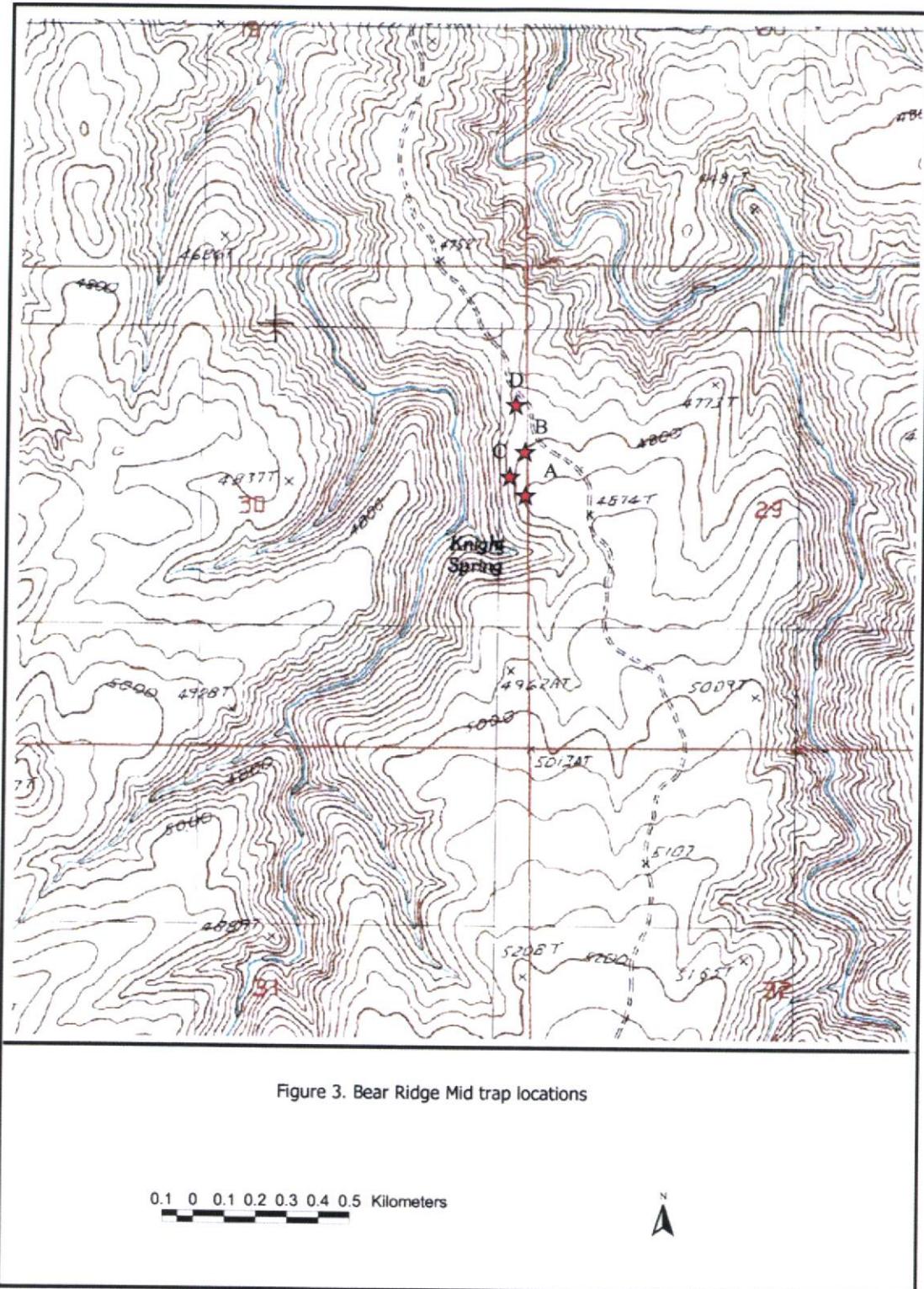


Figure 2. Bear Ridge North trap locations

0.1 0 0.1 0.2 0.3 0.4 0.5 Kilometers





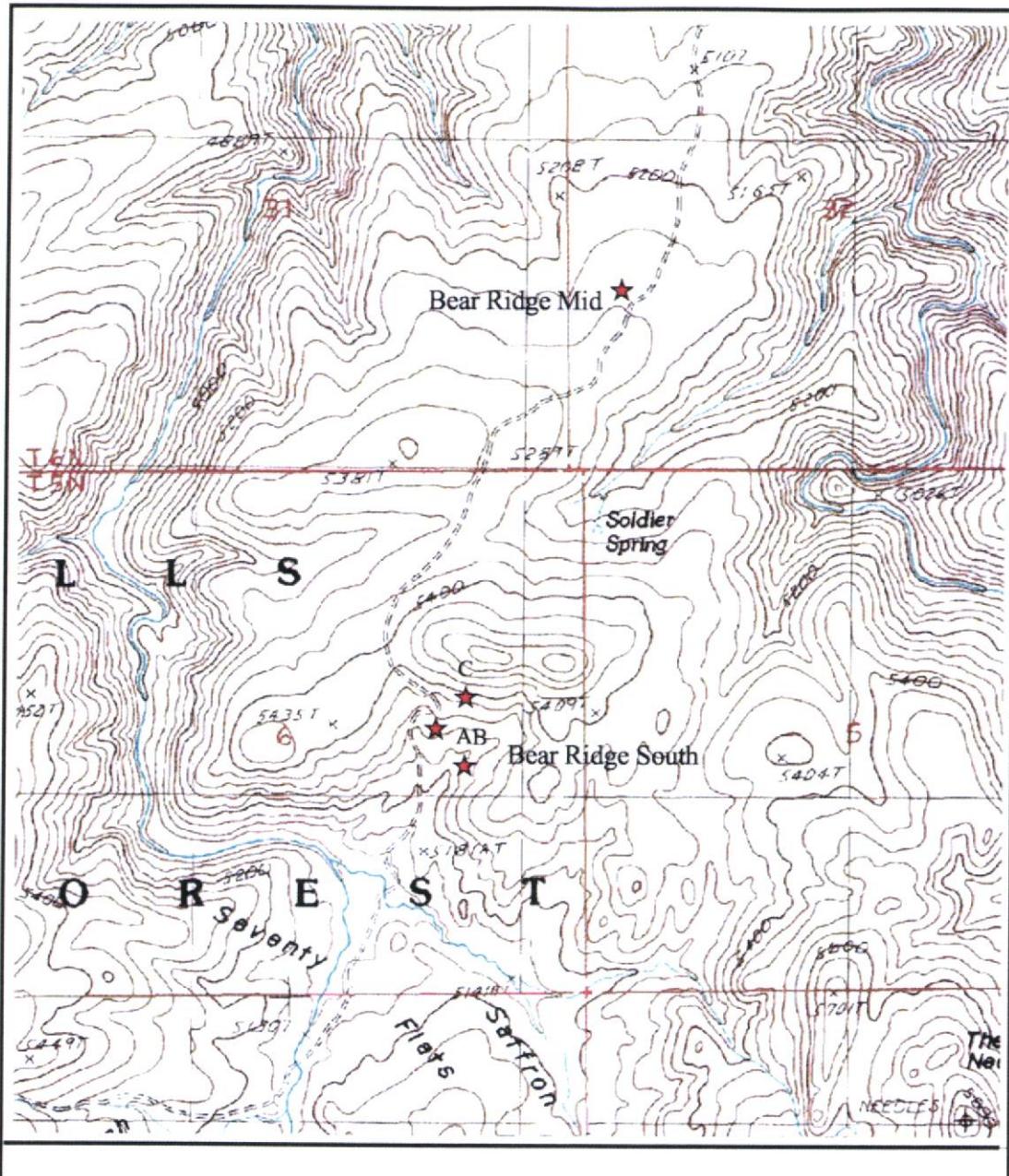
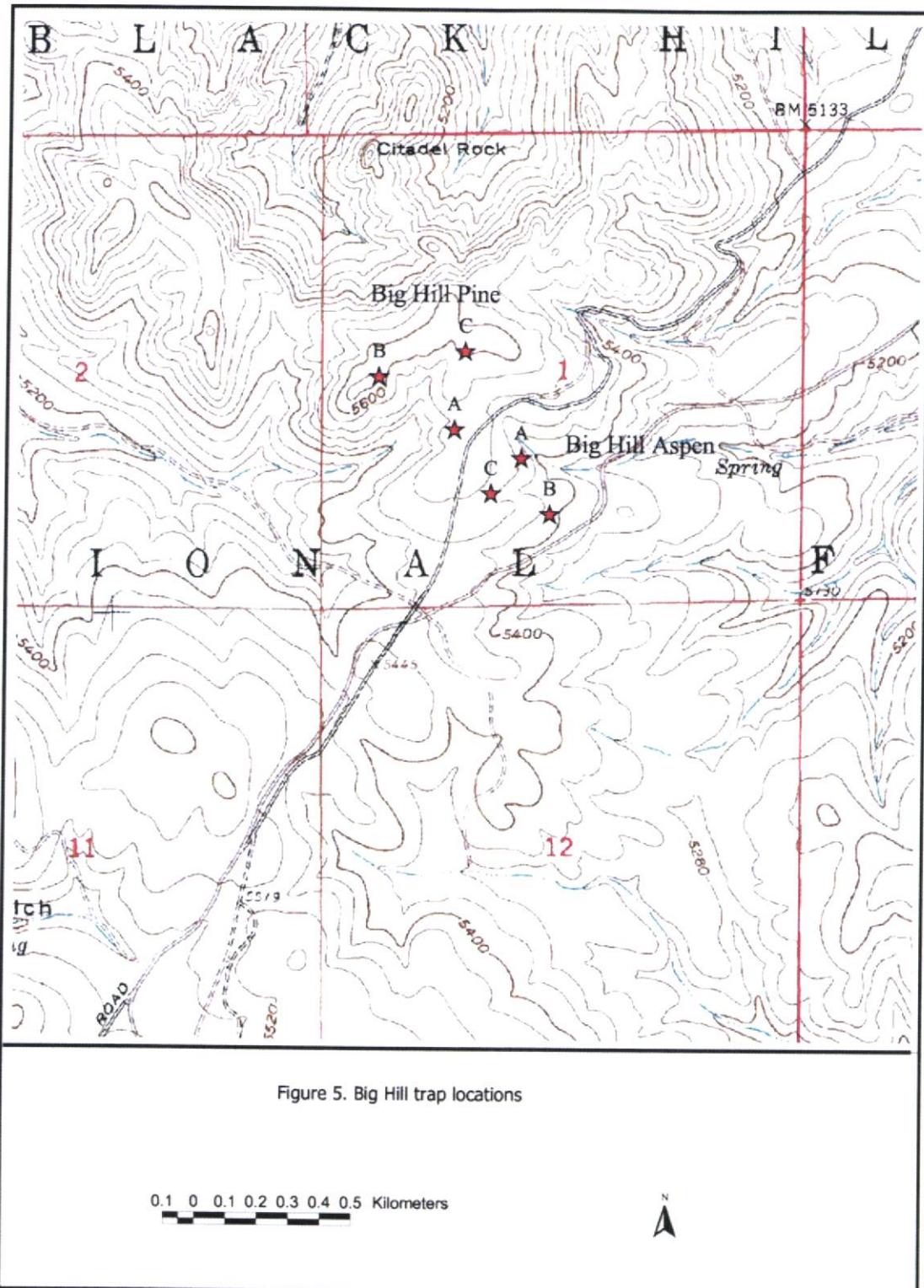


Figure 4. Bear Ridge Mid and South trap locations

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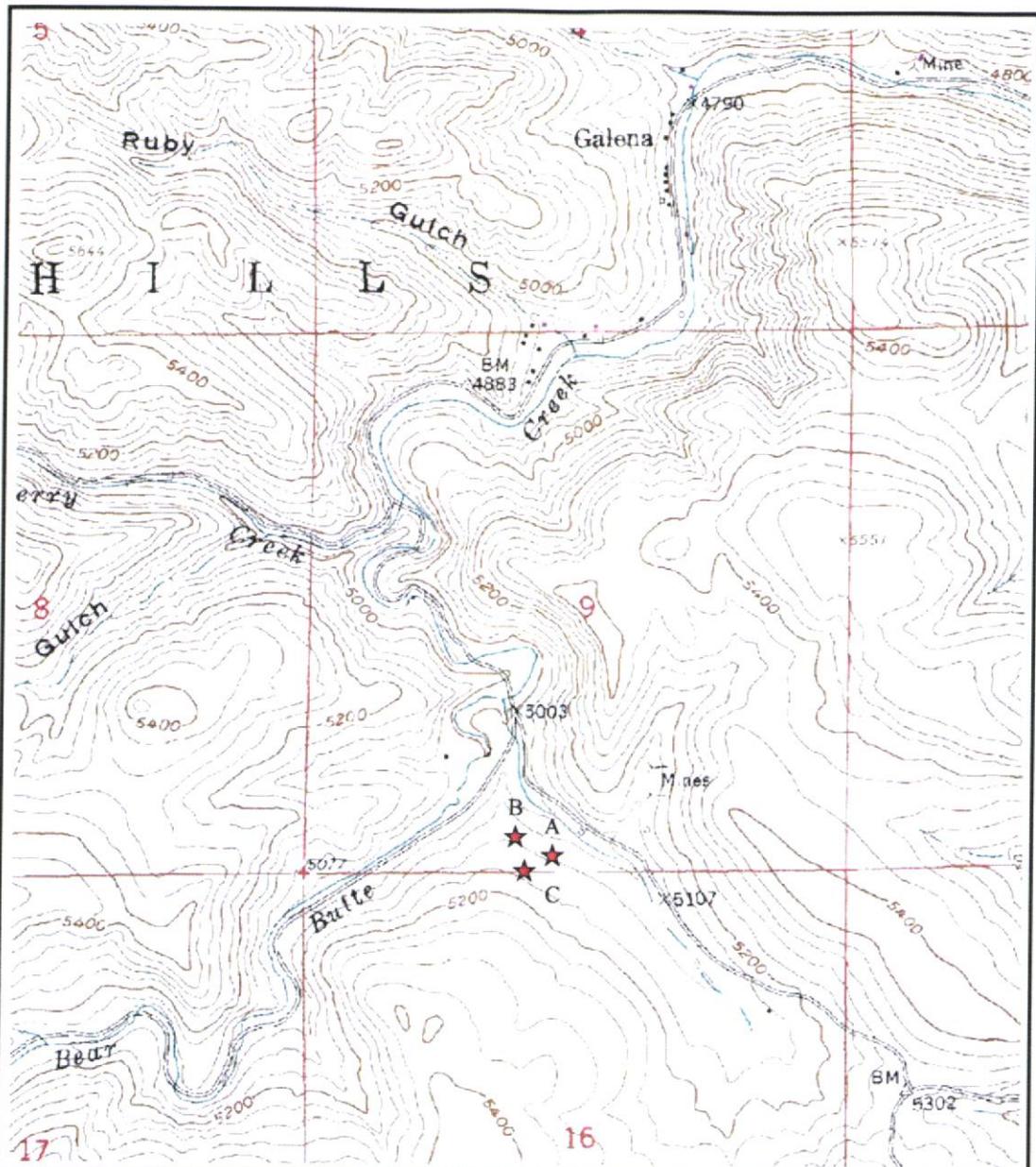
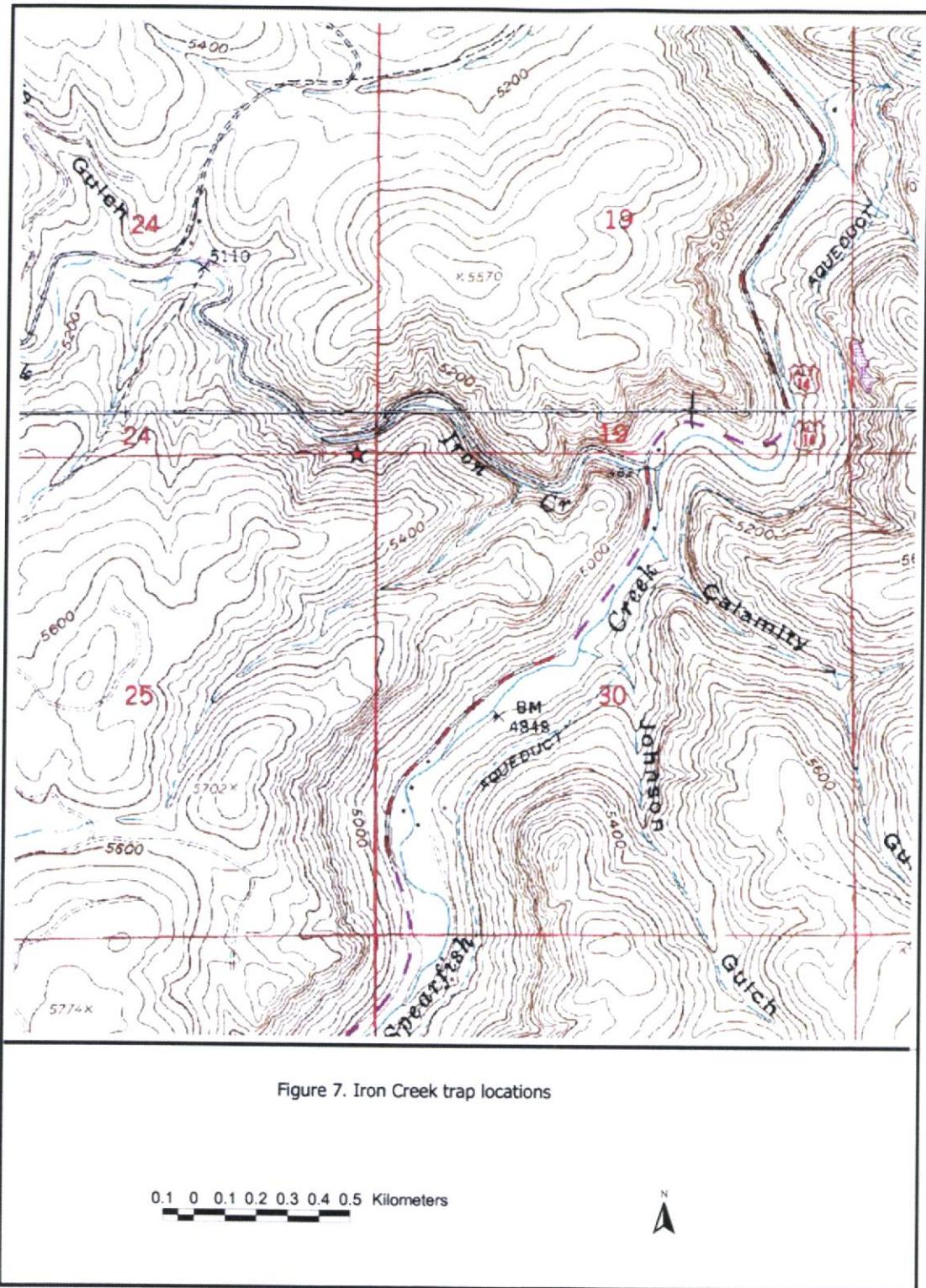
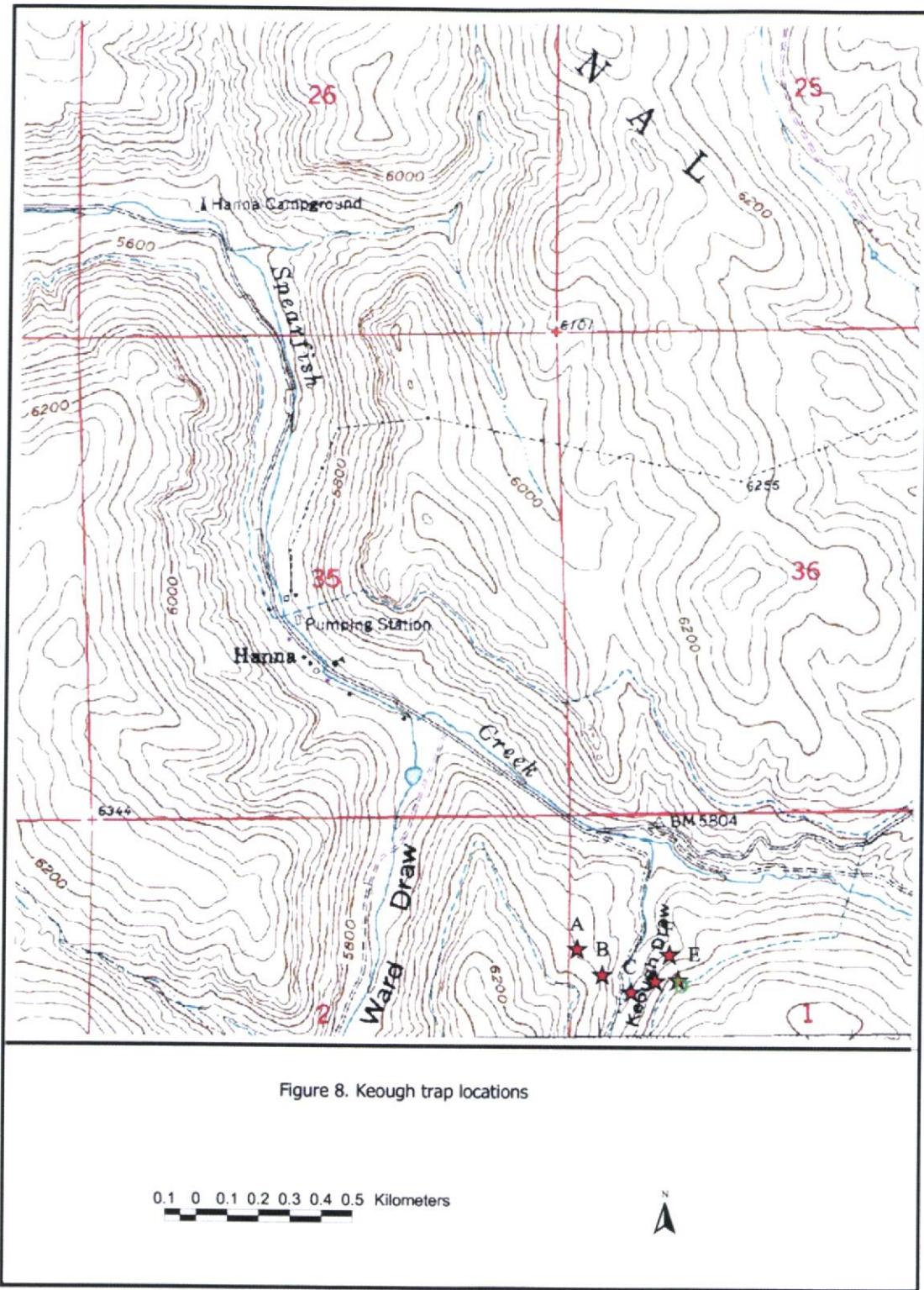


Figure 6. Galena trap locations

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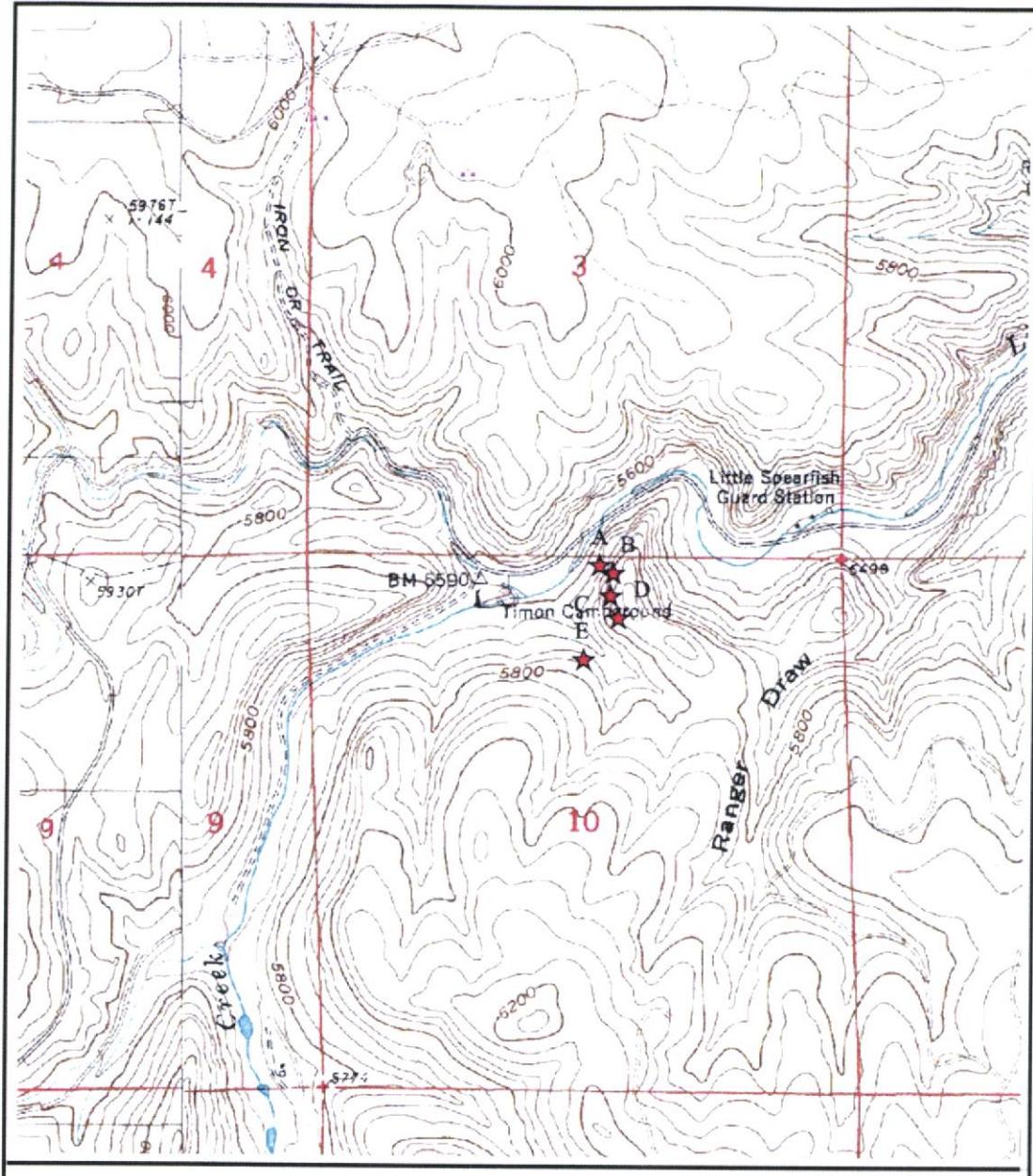
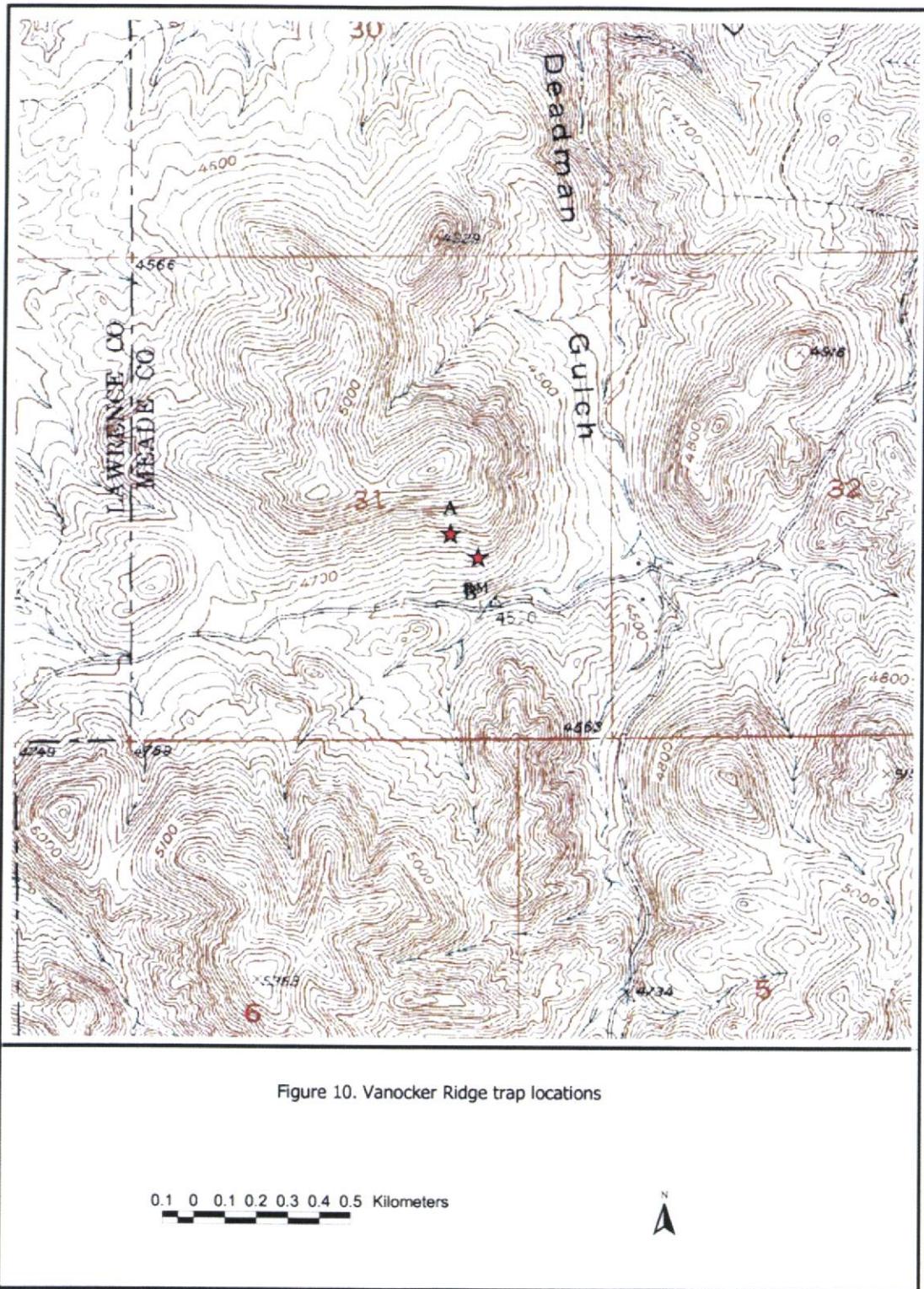
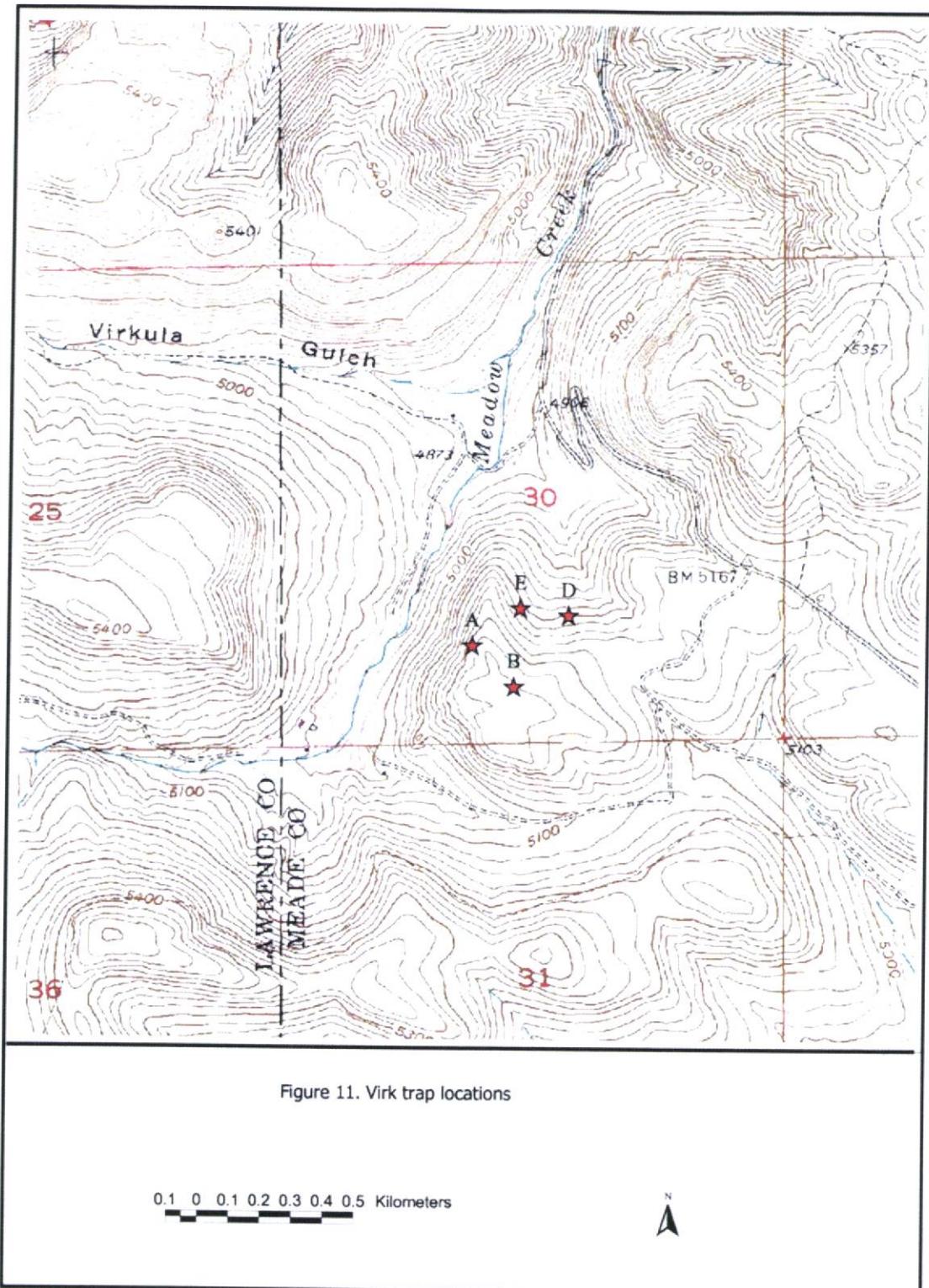


Figure 9. Timon trap locations

0.1 0 0.1 0.2 0.3 0.4 0.5 Kilometers







Appendix B

Additional Site Photographs



Figure 1. Bear Ridge Mid

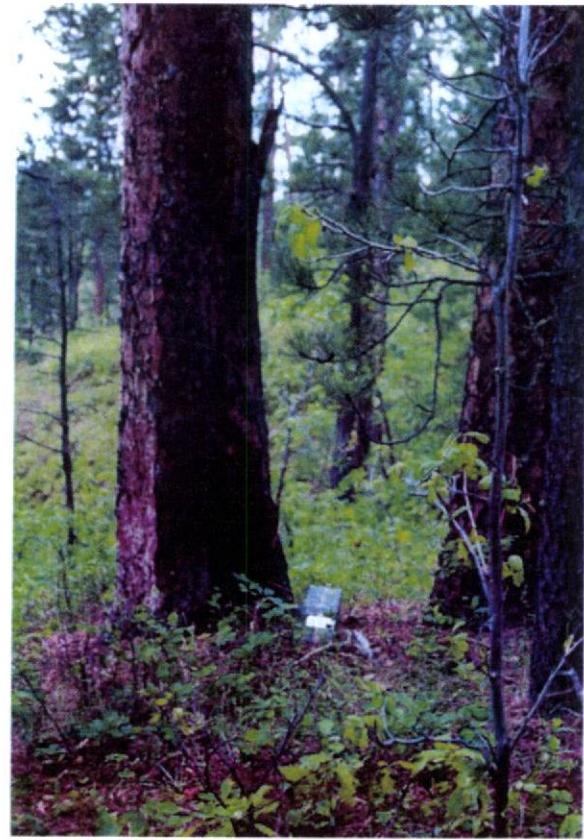


Figure 2. Bear Ridge Mid

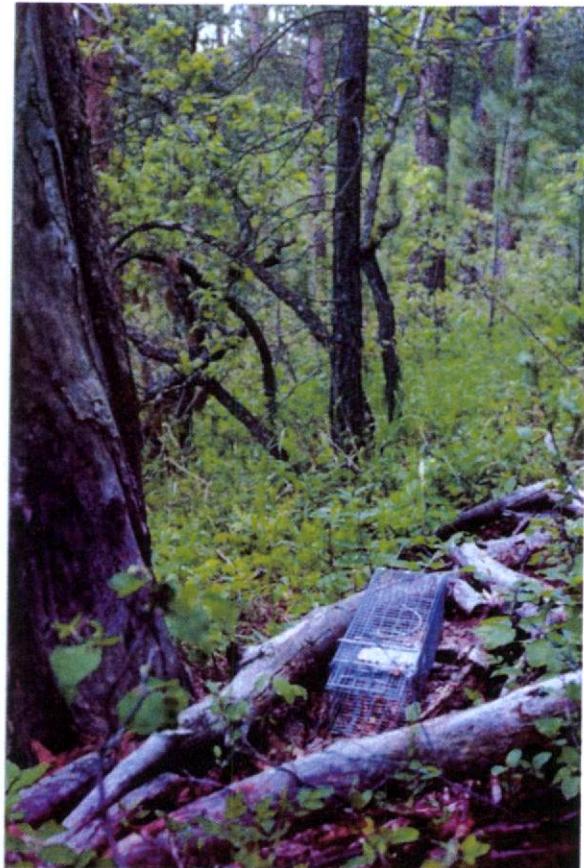


Figure 3. Bear Ridge Mid



Figure 4. Bear Ridge North site A



Figure 5. Bear Ridge North site A



Figure 6. Bear Ridge North site A

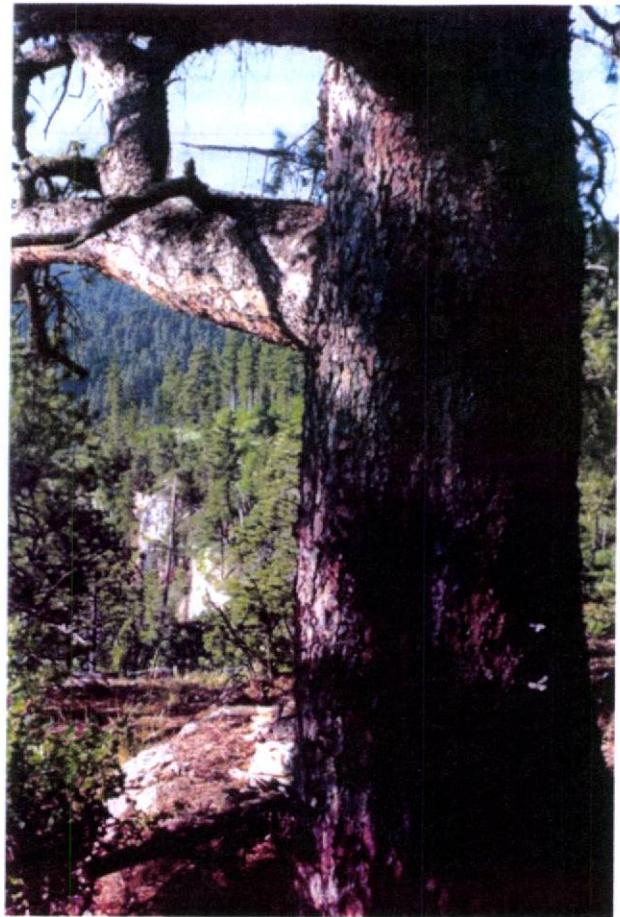


Figure 7. Bear Ridge North site C

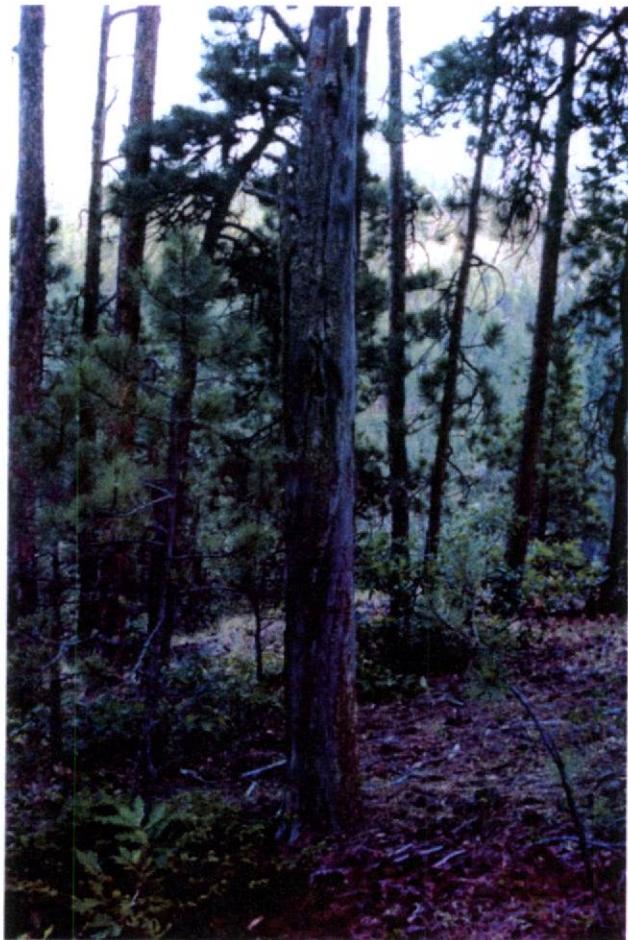


Figure 8. Bear Ridge North (snag used by flying squirrel)

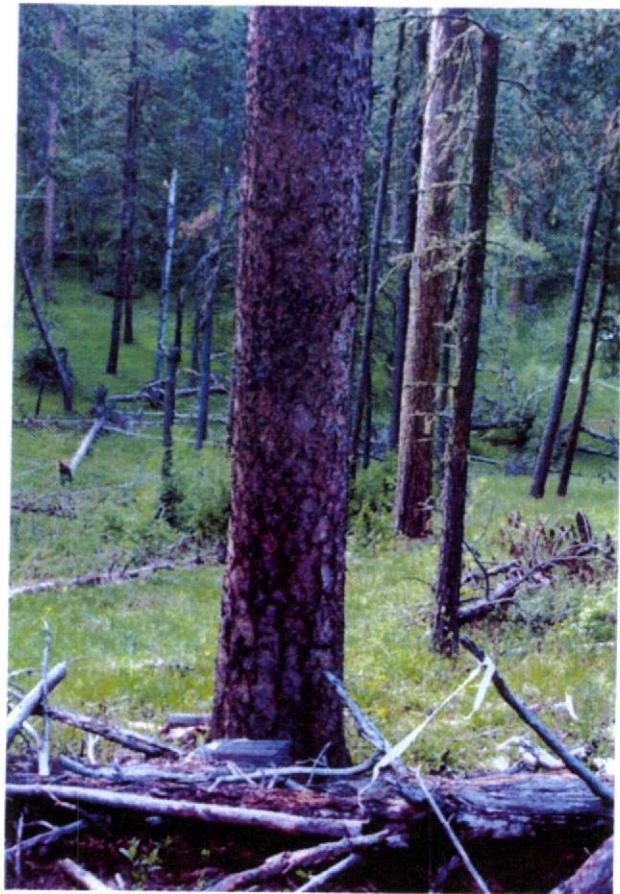


Figure 9. Bear Ridge South

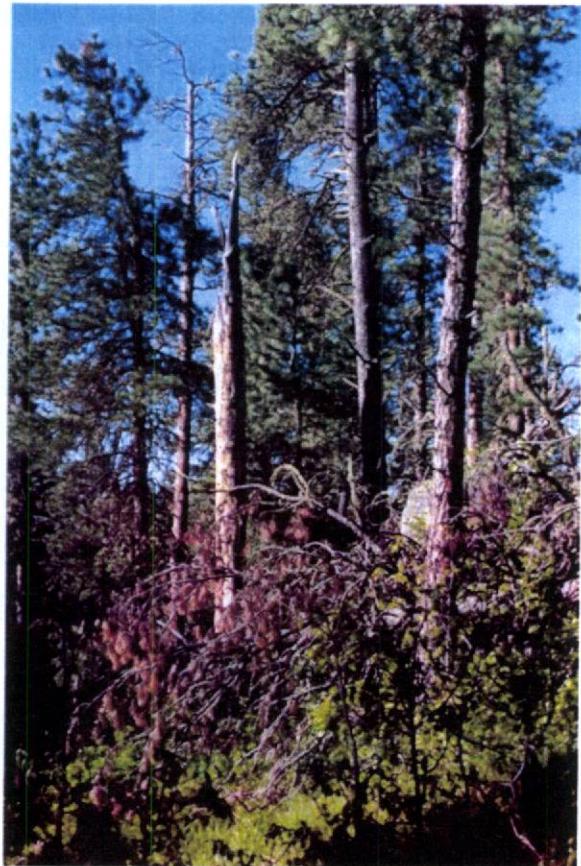


Figure 10. Bear Ridge South



Figure 11. Flying squirrel captured at Big Hill Aspen site A, 8/___/2002

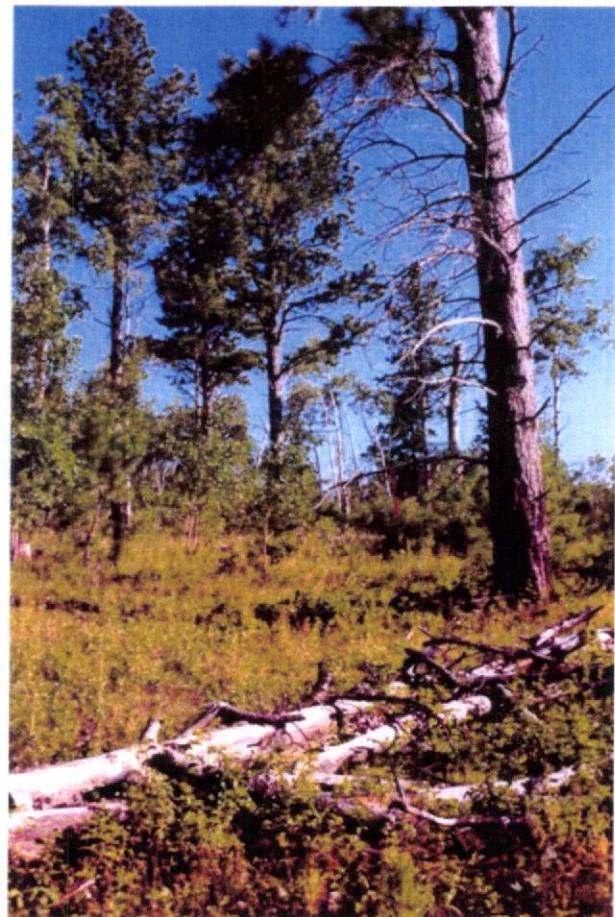


Figure 12. Big Hill Aspen site A

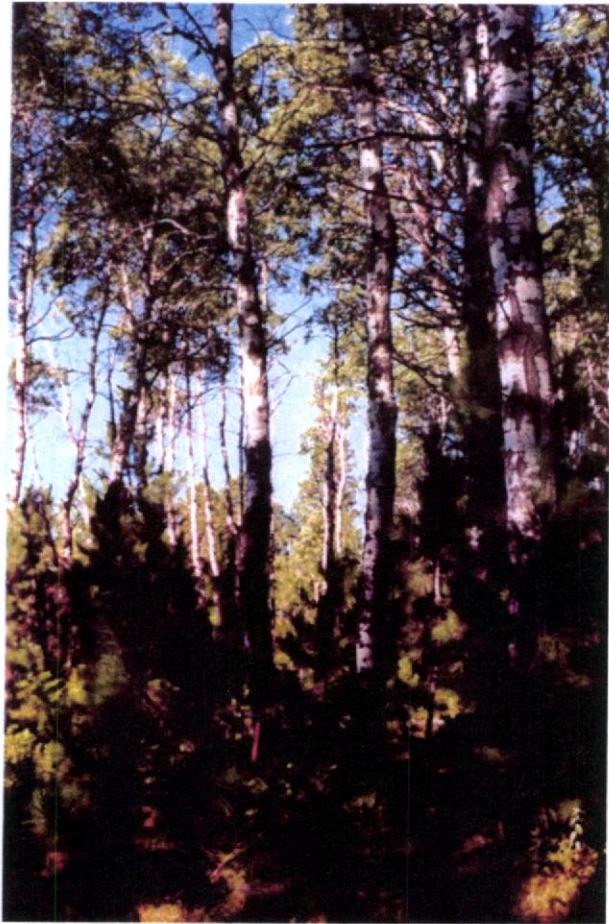


Figure 13. Big Hill Aspen site B



Figure 14. Flying squirrel captured at Big Hill Aspen site B, 8/___/2002



Figure 15. Flying squirrel captured at Big Hill Aspen site C, 8/___/2002



Figure 16. Flying squirrel at Big Hill Aspen site A, 8/___/2002
(after being released, ran up author's back and jumped to tree)



Figure 17. Big Hill Pine site A



Figure 18. Big Hill Pine site B



Figure 19. Galena site B



Figure 20. Galena site C



Figure 21. Iron Creek



Figure 22. Trap damaged at Iron Creek
Note bent trigger wire and rear cage door



Figure 23. Keough Draw site B



Figure 24. Keough Draw site C



Figure 25. Keough Draw site F



Figure 26. Flying squirrel captured at Timon site B (9/7/2003)



Figure 27. Flying squirrel captured at Timon site D (9/7/2003)



Figure 28. Flying squirrel captured at Timon site D (9/7/2003)



Figure 29. Timon site A



Figure 30. Timon site C

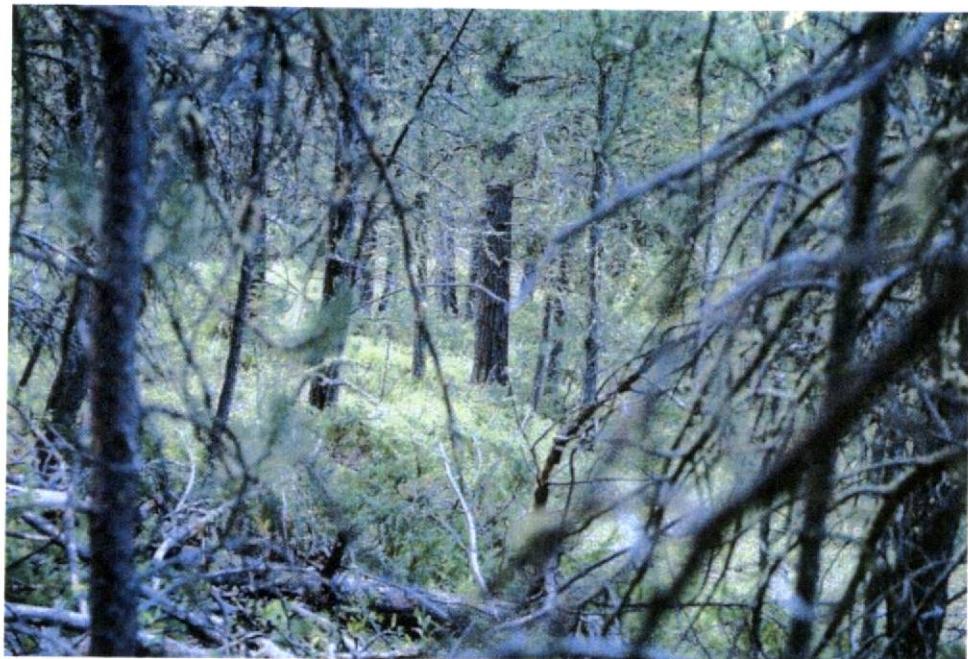


Figure 31. Timon site D



Figure 32. Flying squirrel captured at Timon site D, ____/2003

Appendix C

Survey Site Data

Flying Squirrel Survey Locations, 2002-2003

Location	Legal Description	Lat/Long	UTM	Average Elevation (ft)	Average Elevation (m)	Directions	Map
Bear Ridge Mid	T6N, R1E, NE Sec. 30	44° 27" 26' N, 104° 1" 57' W	13576970 E, 4922891 N	4634	1412	West side of FDR 131, just south of wire cattle gate; 1.7 miles south of national forest boundary	
Bear Ridge North	T6N, R1E, NE Sec. 19	44° 28" 9' N, 104° 2" 0' W	13576885 E, 4924236 N	4591	1399	0.1 mile east of FDR 131, below hill break but above rimrock	
Bear Ridge Spur	T6N, R1E, NE Sec. 31, NW Sec. 32	44° 26" 41' N, 104° 1" 51' W	13577116 E, 4921516 N	5063	1543	Along spur road off west side of FDR 131	
Bear Ridge South	T5N, R1E, NE Sec. 6	44° 25" 27' N, 104° 2" 7' W	13576786 E, 4919216 N	5389	1643	East/south side of FDR 131 in grove of tall trees	
Big Hill Aspen	T5N, R1E, center Sec. 1	44° 25" 29' N, 103° 56" 27' W	13584302 E, 4919367 N	5412	1650	0.2 mile NE of Big Hill trail parking lot, north of FDR 134, south of two-track road	
Big Hill Pine	T5N, R1E, NW Sec. 1	44° 25" 37' N, 103° 56" 32' W	13584192 E, 4919633 N	5425	1654	0.2 mile NE of Big Hill trail parking lot, north of FDR 134 and two-track road	
Galena	T4N, R4E, south-central Sec. 9	44° 18" 55' N, 103° 38" 44' W	13608021 E, 4907555 N	5250	1600	0.1 mile south of FDR 534, 0.25 mile south of FDR 534 sharp corner at Bear Butte Creek	
Iron Creek	T5N, R2E, SW Sec. 19	44° 22" 27' N, 103° 55" 41' W	13585393 E, 4913781 N	4999	1524	South side of Iron Creek about .3 mile upstream from Spearfish Creek	

Flying Squirrel Survey Locations, 2002-2003

Location	Legal Description	Lat/Long	UTM	Average Elevation (ft)	Average Elevation (m)	Directions	Map
Keough 2002	T3N, R2E, NW Sec. 1	44° 15" 8' N, 103° 49" 54' W	13593282 E, 4900340 N	5806	1770	0.1 mile up Keough Draw road from intersection with FDR 196	
Keough 2003	T3N, R2E, NW Sec. 1	44° 15" 8' N, 103° 49" 54' W	13593282 E, 4900340 N	5806	1770	0.1 mile up Keough Draw road from intersection with FDR 196	
Timon	T4N, R1E, north-central Sec. 10	44° 19" 40' N, 103° 59" 5' W	13580953 E, 4908576 N	5676	1730	0.14 mile ESE of Timon campground	
Vanocker Ridge	T5N, R5E, central Sec. 31	44° 21" 2' N, 103° 33" 23' W	13615065 E, 4911606 N	4760	1451	Park on FDR 170 0.5 mile west of junction with FH 26; go north 0.15 mile (halfway up steep ridge) Gravel road off Forest Highway 26 just north of Vanocker gravel pit road - go west .34 mile - take 2-track north & west .39 miles	
Virk	T4N, R5E, south-central Sec. 30	44° 16" 25' N, 103° 33" 47' W	13608021 E, 4907555 N	5194	1583		
Higgins Gulch	T6N, R1E, NW Sec. 13	44° 29" 14' N, 103° 56" 26' W	13584249 E, 4926316 N	4000	1219		
Black Hills Meridian							
Elevation from Maptech digital quadrangles							
Lat/long from Maptech digital quadrangles							

Other Wildlife Species
Brown creeper, least chipmunk
Townsend's solitaire, red squirrel, common nighthawk, chipmunk, mule deer
Ruby-crowned kinglet, white-tailed deer
Common nighthawk, least chipmunk, red squirrel, mule deer, elk
Hairy woodpecker, red-naped sapsucker, gray jay, robin, black-capped chickadee, western tanager, common flicker, yellow-rumped warbler, white-winged juncos, red-breasted nuthatch, chipping sparrow, turkey, long-tailed vole, coyote, red squirrel, least chipmunk
Red squirrel, red-naped sapsucker, ruby-crowned kinglet, black-capped chickadee, white-winged junco, robin
Oreohelix snails, willow

Other Wildlife Species

Golden-crowned kinglet, elk, white-winged junco, red squirrel, chipmunk, hairy woodpecker, black-capped chickadee

Ruby-crowned kinglet, Townsend's solitaire, robin, red squirrel, common yellowthroat, song sparrow, tree sparrow, swift, McGillivray's warbler, gray jay, ruffed grouse, western tanager, yellow-rumped warbler, white-winged junco, black-capped chickadee, red-breasted nuthatch, red-naped sapsucker, common flicker, turkey vulture, belted kingfisher, least chipmunk, dipper (winter)

Townsend's solitaire, gray jay, yellow-rumped warbler, red-breasted nuthatch, hairy woodpecker, porcupine skin (mtn lion kill?), white-tailed deer

Appendix D

Trap Site Data

Flying Squirrel Trap Sites, 2002-2003

Location	Site	Trap Placement	Slope	Aspect	Slope Position	Oversstory Vegetation	Oversstory Cover	Understory Vegetation	Understory Cover	Snag Size
Bear Ridge Mid A		Trap 1 at base of 20+" dbh pine snag with loose bark				Tall pine with long, clear boles		Occasional oak brush, patches of pine regen		
Bear Ridge Mid B		Trap 2 on hard log								
Bear Ridge Mid C		Trap 3 on snowbend								
Bear Ridge Mid D		Trap 4 next to rotten log								
Bear Ridge North	A	Trap 1 on leaning tree 3' above ground, trap 2 at base of tree	0% Level		Ridgeslope, 100' above sandstone rimrock, 150' below limestone outcrop	Pine, 80 BA, mostly small sawtimber, trap tree 27" dbh, wolfy pine.	40% just needles)	<i>Ribes</i> , common juniper, patches of oak brush, grass, old pine slash (lots of bare ground with	Large dbh (20"+)	
	B	Trap 3 on branch of tree just above sandstone rimrock (5' above ground), trap 4 at base of tree	35% E			Pine, 120 BA live, 30 dead, trap tree 13.5" dbh down log (top of snag)	40%	Dogbane, oak brush, licorice, grass, needles, russet buffaloberry	Avg dbh ~ 15", avg height ~40'	
Bear Ridge North	C	Trap 5 on branch of 25" dbh tree on top of limestone cliff, trap 6 at base of tree	25% E		Midslope, just above sandstone rimrock	Pine, 120 BA live, 10 dead, dbh 5-20", mostly 10-20". Trap tree 20" dbh, live with lots of dead branches	30%	Oak brush (not continuous or dense), juniper, dogbane, leadplant, a few pp seedlings, sparse grass, poison ivy, needles & cones	Moderate dbh (10-15"), 10-50' tall	
	A	Big grove - trap 1 at base of 15" dbh snag, trap 2 at base of 70'-tall, 20+" dbh pine snag with cavities	35% S		Midslope	Pine, 10-35" dbh, up to 90' tall	20-50%	Kinnickinnick	Very large (25" dbh), up to 70' tall	
Bear Ridge South	B	Draw bottom below big grove - trap 3 on fallen aspen suspended 3' above ground, trap 4 at base of aspen snag	0% Level		Draw bottom	Pine, aspen, birch		Raspberry, aspen regen, violet, grass, hazel	8-15" dbh,	

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Location	Site	Trap Placement	Slope	Aspect	Overstory Vegetation	Overstory Cover	Understory Vegetation	Understory Cover	Snag Size
Bear Ridge South	C	Steep hillside - trap 5 on aged, hard pine log	50% S	Midslope					
Bear Ridge Spur	A	Trap at base of pine snag with red squirrel cache	5% WNW		Top of broad ridge Pine		Bur oak		
Bear Ridge Spur	B	Trap at base of half-dead aspen w/cavities	5% WNW		Top of broad ridge Pine, aspen		Bur oak, birch		
Bear Ridge Spur	C	Trap 3 at base of pine snag, trap 4 at base of dying pine (bug tree), trap 5 at base of live pine next to decayed log	5% WNW		Top of broad ridge Pine, aspen		Bur oak, birch, juniperberry, dogbane, grass		
Bear Ridge Spur	D	Trap in 8" dbh pine on branch 6' up, near clearcut	5% WNW		Top of broad ridge Pine		Bur oak, grass		
Bear Ridge Spur	E	Trap 2 in 20" dbh pine on branch 6' up, trap 3 at base	5% WNW		Top of broad ridge Pine		Bur oak		
Big Hill Aspen (2002)	A	Trap 1 in 20.7" dbh pine on branch 4.5' above ground, trap 2 at base of tree	10% SE				Aspen regen, Amelanchier, lupine, juniper, grass, snowberry, bracken fern, kinnikinnick, sparse oak saplings		Aspen 8-10" dbh, pine 95% 13.9" dbh
Big Hill Aspen (2002)	B	Trap 3 on 4" dbh twisted pine sapling 3' above ground, trap 4 on ground near #3. Within 100' of FDR 134.	5% N				Swale in gradual slope	50-75%	Same dbh 95% range as live

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Location	Site	Trap Placement	Slope	Aspect	Slope Position	Overstory Vegetation	Overstory Cover	Understory Vegetation	Understory Cover	Snag Size
Big Hill Aspen (2002)	C	Trap 5 on leaning aspen (8.8" dbh, trap 4'3" up), trap 6 at base of tree. Two-track within 300', FDR 134 within 0.25 mile.	5% S	Midslope	Mature aspen, not as decadent as site 2. 170 ba live aspen, 7.8-8.8" dbh. 30 ba dead aspen.	50% oak shrubs, grazed aspen shrubs, juniper, pine seedlings, grape, horsemint, kinnikinnick, oregon grape, horsemint, juniper, pine seedlings, grazed aspen shrubs, oak shrubs	50%	Bracken fern, <i>Poa</i> , kinnikinnick, oregon grape, horsemint, juniper, pine seedlings, grazed aspen shrubs, oak shrubs	95% 10" dbh	Less than 95% 10" dbh
Big Hill Aspen (2003)	A	Trap 1 on partly fallen aspen, 30% angle; trap 2 on ground below	10% NE	Aspen						
Big Hill Pine	A	Trap 1 in 18" dbh pine on branch 5' up, trap 2 at base of tree	5% W		Middle of gradual slope	Pine, 80 BA live, no dead	50%	Common juniper, oregon grape, <i>spiraea betulif</i> "	10-20" dbh	
Big Hill Pine	B	Trap 3 in 8.7" dbh pine on branch 5.5' up, trap 4 at base of tree	25-30%	W	Middle of gradual slope	Pine, 100 BA (30 saw, 70 pole), 0 BA dead	60%	Common juniper, oregon grape, chokecherry, needle duff, slash		
Big Hill Pine	C	Trap 5 in 11.8" dbh pine on branch 3' up, trap 6 at base	5-10%	SW	Gradual hilltop	Pine, 120 BA (50 saw), 0 BA dead	50%	Common juniper, junberry, kinnikinnick, needle duff	75% n/a	
Galena	A	Trap 1 on spruce log, 30% angle, 2' above ground; trap 2 on ground	10% NE	Midslope	50 ba live spruce, 30 ba live aspen (8" dbh, 35"), 10 ba dead spruce, 10 ba dead aspen, 30 ba live pine (25" dbh, 70').	80% leaves	Spruce saplings, juniper, moss, lichens, fallen	See sites B & C	60% leaves	

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Location	Site	Trap Placement	Slope	Aspect	Slope Position	Overstory Vegetation	Overstory Cover	Understory Vegetation	Understory Cover	Snag Size
Galena	B	Trap 5 on partly fallen aspen, nearly horizontal, 6' above ground; trap 6 on ground at base of spruce sapling		10% NE	Midslope	20 ba live aspen (10", 45'), 40 ba live spruce (9", 40'), 40 ba live pine (1@17", 60', others smaller), 60 ba dead aspen, 10 ba dead spruce, 1 birch 3" dbh.	80%	Spruce saplings, kinnikinnick, oregon grape, scattered juniper, moss, lichens, fallen leaves	90%	Aspen 9", spruce 10", large pine 20"+)
Galena	C	Trap 3 on fallen spruce, 1' above ground; trap 4 on ground (both in spruce regen cul de sac)		5% NE	Midslope	30 ba live aspen (10" dbh, 35'), 20 ba live spruce (8-12", 50'), 50 ba live pine (9-22", 30-65'), 10 ba spruce (15", 30'), scattered birch	80%	Dense spruce regen 3" dbh, 15' tall, kinnikinnick, oregon grape, juniper, moss, lichens, fallen leaves	80%	Spruce 15", Spruce 30'
Iron Creek	A	Trap 1 at base of pine snag, trap 2 under spruce		80% N		Mature & pole pine, spruce; small birch	30%			
Keough (2002)	A	Trap at base of 30" dbh pine with big rotten fire scar		20% NE				Spruce/pine		
Keough (2002)	B	Trap at base of 12" dbh pine with holes		30% NE				Spruce/pine		
Keough (2002)	C	Trap on ground in floodplain forest		0% Level				Spruce, scattered pine		
Keough (2002)	D	Trap on ground in aspen/spruce draw								
Keough	A	Trap 1: 6' up on branch of suppressed pole-size pine, trap 2 at base of tree		15% NE		Base of shallow draw		30 ba live pine (16" dbh, height 60'), 30 ba live spruce, 10 ba live aspen	70% a little juniper	5-10" dbh, height 10-6', aspen stubs, grass, 90% 30'

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Location	Site	Trap Placement	Slope	Aspect	Slope Position	Overstory Vegetation	Overstory Cover	Understory Vegetation	Understory Cover	Snag Size
Keough	B	Trap 3: 3' above ground on 5" dbh spruce leaning at 30°, trap 4 at base of 15" dbh 45' snag with loose bark of 35% slope)	15% (just above break	Broad ridgeline	Edge between dense mature spruce slope and less dense pine/spruce ridge. 150 ba live pine (8-13" dbh, 45-50'), 30 ba live spruce (5" dbh, 25'), 10 ba dead aspen, 10 ba dead pine			Aspen shrubs, occasional spruce regen, scattered juniper, rose, needles	90%	2 pine (5-6" dbh, 15'), 1 spruce (8" dbh, 35'), 3 aspen (10" dbh, 15'), 60% aspen stubs
Keough	C	Trap 5 on 15" dbh partly fallen spruce in draw bottom	10% NW	Just above flat drainage bottom, at toe of steep slope	60 ba live spruce (12-15" dbh, 50-80'), 40 ba dead spruce, 80-except for hole caused by trap tree		Scattered patches of spruce saplings, <i>Sambucus</i> , bunchberry		100%	Some 9" dbh, 30-40', biggest 14"
Keough	D	Trap 6 in spruce (11" dbh, 45-50'), trap 7 at base	30% WSW	Just above steep break	110 ba live spruce, 80 ba live pine, 0 dead. Dense spruce pocket, more xeric than opposite slope		A few juniper		30%	Aspen 3-5", 15", pine 12", 45'
Keough	E	Trap 8 in 14.5" dbh pine (50' tall, branch 5.5 up), trap 9 at base of old, fire-hardened pine stump	30% WSW	Midslope	70 ba live pine (10-17", 50-60'), 50 ba live spruce, 30 ba dead pine, 10 ba dead spruce. Edge of small opening, more xeric than opposite slope, dense in spots		Juniper, 1 spruce sapling, needles, very old dying willow brush nearby, must have been more open previously		50%	Pine 8" dbh, 20-25', spruce 7", 30', aspen 6"
Keough	F	Trap 10 solid on big flat branch (4' up) in 16" dbh very wolly pine	12% W	On long gently sloping hill just above 70% short slope into floodplain	70 ba live pine, 10 ba live spruce, 10 ba dead aspen		Spruce regen (1-7' tall, sparse), scattered juniper, needles, buffaloberry & kinnikinnick		50%	Several small aspen, 1 pine (10" dbh, 20')
Timon	A	Trap 1 on spruce branch 5' above ground, trap 2 at base of tree	35% NW	Midslope	80% spruce, 20% pine, total 120 BA, with pine just upslope, avg height 60-80'		Patchy, 50-90%	Juniper, slash, needles, moss, lichens	100%	5-15" dbh, height 15-40'
Timon	B	Trap 3 at base of pine snag, trap 4 on spruce log 1' above ground	33% NW	Midslope	50% spruce, 50% pine		Patchy, avg buffaloberry, grass, moss, lichens		90%	2-21" dbh, height 10-40'

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Location	Site	Trap Placement	Slope	Aspect	Slope Position	Overstory Vegetation	Overstory Cover	Understory Vegetation	Understory Cover	Snag Size
Timon	C	Trap 5 on pine branch 3' above ground, trap 6 at base of tree	45% SW		Midslope	90% pine, 10% spruce, 5-18" dbh (mostly 5-15"), height 60-70', patches of pine snowbends		Lots of juniper, russet buffaloberry	80%	3-5" dbh, 90% height 20'
Timon	D	Trap 7 on pine branch 6' above ground (tree 18" dbh), trap 8 at base of tree	45% SW		Almost at hilltop, ~60' below rock cap of hill	Pine, mostly ~5" or 10-15" dbh, height 30-50', branched Spruce 50% (10-15" dbh, height 40-50'), pine 30% (15-18" dbh, height 50'), aspen 10% (5-6" dbh, height 20'), birch 10% (4-5" dbh, height 20')	Patchy, 50-80%	Juniper, russet buffaloberry, rock	80%	9" dbh, 80% height 25'
Timon	E	Trap 9 on horizontal birch branch 4' above ground, trap 10 at base of tree	40% NE		Midslope					1 pine 8" 30', 2 spruce 10" 25', many aspen 5" 10'
Vanocker Ridge	A	Trap 7 on pine branch 5' above ground, solid; trap 8 at base of tree on uphill side		70% S		All yellowbark pine		Some pine regen, needles, phlox, grass, sand lily, yucca, 30% chokecherry		70% Large
Vanocker Ridge	B	Trap 9 on pine branch 5' above ground, a little shaky; trap 10 at base of tree; trap 5 in tree, trap 6 on ground		50% S		Mixed yellowbark & stagnant pole pines	80% Needles			Large
Virk	A	Trap 1 on pine branch 4' above ground, a little shaky; break of 50% slope) trap 2 at base of pine		NW		Uphill: 15-18" dbh pine with scattered aspen, scattered pine regen; downhill: more pine regen, thicker (120 BA).				
Virk	B	Trap 3 in half-dead aspen, 5 above ground, solid; trap 4 at base		0% Level		Aspen stand on one side (aspen 70 BA, pine 30 BA), pine on the other (90 BA).		Grass, juniper,		
Virk	C	Trap 5 at base of pine (trap 6 out of order)		0% Level		Pine 70 BA, 100' from aspen clone on each side, one young, one decadent		Grass, scrawny aspen regen		

BA=basal area, DBH=diameter, FDR=forest road, PP=forest road, TPA=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Snag Frequency	Snag Species Condition	Down Wood Cover & Size	Distance to Water	Lichens/ Fungi; Obstructions	Site Moisture	Other
			0.4 mile to spring			Brown creeper on trap tree
			0.4 mile to spring			
			0.4 mile to spring			
			0.4 mile to spring			
Ephemeral stream .2 mile (line of sight) down steep slope; no springs or stock tanks closer than 0.5 miles						
2 standing within 100' of traps	Pine	Old, bark gone, soft, with cavities	2 large fallen snags within 100' of traps, old slash mile	Scattered Usnia on twigs	Few	Very xeric
						Soil mostly organic, more developed than site A. Red squirrel cone cache
8 within 100' of traps	Pine	All stages of decay	Dense, some 20"+	See site A	Few	Xeric
4 within 100' of traps	Pine	Mostly gray, soft, with cavities	Not much	See site A	Usnia on twigs, bright yellow crustose on wood, green on wood	Xeric
					Few (100'x100' patch of <3' tall oak just uphill with no pine overstory)	No cone caches. Snag used by flying squirrel 13.5" dbh, 10' tall, very rotten. Soil more red than above (more sandstone)
Many	Pine	All stages, many cavities	80%, all sizes	0.5 mile (to spring/stock tank)	Fungi on snags	None
						Moderately xeric
Many	Pine, aspen	All stages, many cavities	20%, 1-15" dbh	0.5 mile (to spring/stock tank)	Fungi on snags	Few
						Moderately mesic

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Snag Frequency	Snag Species Condition	Down Wood Cover & Size	Distance to Water	Lichens/ Fungus	Gliding Obstructions	Site Moisture	Other
		Numerous down logs of all sizes & stages of decay	0.5 mile (to spring/stock tank)		Few	Xeric	No cone caches
	Either very old, gray & soft, or fresh bug kills	Scattered, small to moderate size	0.4 mile to spring	Bits of Usnia on tree trunks	Oak brush		
	See site A	See site A	0.4 mile to spring	Fungus on aspens	Oak brush		
	See site A	See site A	0.4 mile to spring	Scattered Usnia	Few		
	See site A	See site A	0.4 mile to spring	Scattered Usnia	Oak brush		
	See site A	See site A	0.4 mile to spring	Scattered Usnia	Oak brush		
7 within 100' of traps	Aspen, pine	With cavities	8'-diameter pine slash pile, other pine slash scattered	0.3 mile to muddy cattle dugout, 0.5 mile to spring	A little Usnia on the trap tree	Few	Limestone, some exposed rock; sandy loam with lots of organic and A layer. No red squirrel caches.
10 within 100' of traps	Aspen	Many cavities in both live and dead aspen	Dry aspen branches and small trunks, 20% to spring	0.3 mile to muddy cattle dugout, 0.5 mile	Shelf fungi on aspen	Midstory pine	Damp

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa ping, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Snag Frequency	Snag Species	Snag Condition	Down Wood Cover & Size	Distance to Water	Lichens/ Fungi	Gliding Obstructions	Site Moisture	Other
20 within 100' of traps	Aspen	Several broken tops, not a lot of obvious cavities	Dry & rotten aspen <10" diameter, enough to trip over constantly	0.3 mile to muddy cattle dugout, 0.5 mile orange crustose lichens on aspen	Shelf fungi, lichens on aspen	None	50-50	Limestone, fine sandy loam
2 within 100' of traps	Pine	Gray, soft, cavities	Pockets of logging slash	0.3 mile to muddy cattle dugout, 0.5 mile to spring				
1 within 100' of traps	Pine		Grouped & scattered slash	0.5 mile to muddy cattle dugout, 0.7 mile to spring	Usnia in pine	None		Soil=sandy loam, No red squirrel cone caches
0 within 100' of traps	n/a		Scattered logging slash	0.5 mile to muddy cattle dugout, 0.7 mile other lichens on ground	Usnia in pine, other lichens on ground	Pine poles with many branches		Exposed limestone, soil=sandy loam. No cone caches
See sites B & C	See sites B & C			0.5 mile to muddy cattle dugout, 0.7 mile crustose lichens on bark	Usnia in pine, crustose lichens on bark	Pine saplings		Some exposed limestone, soil=sandy loam. No cone caches
				70%, aspen, spruce, pine, birch, all ages, flat, lackstrawed	Some Usnia, fungus on aspen	Spruce	Mesic	
				138 feet				

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Snag Frequency	Snag Species Condition	Down Wood Cover & Size	Distance to Water	Lichens/ Fungi: Obstructions	Site Moisture	Other
Many in stand, especially aspen with cavities, broken-top spruce, big pine	Aspen, spruce, pine	Many with cavities	50%, all sizes & conditions	113 feet	Usnia	Spruce
1 spruce, several aspen	Spruce, aspen rotten	Spruce sound, 50% logs, branches	283 feet	Usnia, shelf fungus on live aspen	Spruce	Mesic
		Lots	100'	Numerous; <i>Peltigera</i> & others		
		Lots	100'		Mesic	
		Lots	220'		Mesic	
		Lots	60'		Very mesic	
			180'			
15 within 100' of traps	Mostly pine & spruce, 2 aspen, 1 birch	1 rotten aspen, others fairly sound	Several pine logs 20"+ dbh, small spruce logs	Frequent Usnia, various lichens on horse-log stumps	Few	Damp
			470'			
				More aspen in draw. Witches brooms in spruce. Stand continuous with scattered old bug patches (5-10 trees each), diverse		

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Snag Frequency	Snag Species Condition	Down Wood Cover & Size	Distance to Water	Lichens/ Fungi	Gilding Obstructions	Site Moisture	Other
6 within 100' of traps (plus small aspen stubs, many 3-4' pine stubs from old bug trees)	Pine, spruce, aspen	All, but no cavities visible 40% 1-8" diameter,	240'	Lots of Usnia downhill, less uphill	Spruce branches & saplings	50-50	Stand continuous except for old, small bug patches.
~20 within 100' of traps	Spruce	All	Many down logs 10-20" diameter	80'	Many lichens on logs, lots of Usnia	Spruce branches	Meadow in draw bottom ~200' away from traps, stand otherwise continuous, all spruce in floodplain, unusually tall pine uphill on steep slope
~6 within 100' of traps	Aspen, pine	Aspen old, pine recent	Nothing of any size, just branches, aspen	360'	Usnia	Spruce	Snags scattered, relatively few, nothing really big, old or rotten
3 pine, 1 spruce, 1 aspen	Pine, spruce, aspen	Aspen with holes, others fairly recent, mostly solid	20%, mostly branches	530'	Usnia	Spruce	No big snags in stand. Stand mostly continuous with some denser spruce patches, occasional openings the size of 3-4 bug trees, half-acre patch of mature aspen uphill
~8	Pine, aspen	Hard gray aspen, 1 fresh dead 3-4' gray pine bug kill	Occasional branches, a few dead 3-4' gray aspen	310'	Occasional Usnia	Few (spruce branches in patch uphill)	Stand continuous to the east (meadow downhill to west)
10 within 100' of traps	Pine, spruce, aspen	Hard & soft with cavities, also fresh bug kills	50%, 1-10" diameter	350'	Scattered Usnia, many lichens	Spruce	No red squirrel caches. ~150' from foot trail, gravel road across creek (out of sight).
18 within 100' of traps	Mostly pine, a few spruce	All	30%, all conditions	400'	Scattered Usnia, many lichens	Some spruce	Very mesic Similar to Timon A, occasional witches brooms

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Snag Frequency	Snag Species	Snag Condition	Down Wood Cover & Size	Distance to Water	Lichens/ Fungi: Obstructions	Site Moisture	Other
3 within 100' of traps	Pine	Hard	10%, snowbends and a few 20"+ logs (very rotten)	700'	Scattered Usnia	Pine doghair	50-50 10% rock
3 within 100' of traps	Pine	Soft with cavities, bark on	6-10" diameter, 10%	950'	Scattered Usnia, fungus shelves on snags	Pine doghair	Slightly xeric Just uphill from small opening
1 pine, 2 spruce, many aspen	Pine, spruce, aspen	All	30%, 5-10" diameter	830'	Scattered Usnia	Spruce regen, deciduous trees	Very mesic Spruce witches brooms
Scattered	Pine	Both hard & soft with cavities		1180' (at least)		Xeric	Unstable soil (steep, high rock%), no red squirrel caches
Scattered	Pine	Soft with cavities		980' (at least)			
				2060'	Few other than pine regen 3-5' tall		
				1310'	Occasional mushroom, Usnia in pine		No red squirrel sign
				2560'			Opening & 2-track road within 100'

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Past Activity
No sign of fire. Pole-thinned >20 years ago, a few old signs of cattle
Old fire scars, no cattle sign, no harvest
Old fire scars, no cattle sign, no harvest
Partial cut within last 10 years, no sign of past fire
No sign of past fire

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Past Activity	
No sign of past fire	
	Commercial thinning within past 10 years. Little evidence of past fire
See site A	
	Commercial thinning within past 10 years, close to 10- acre clearcut. Little evidence of past fire
See site A	
	No sign of fire, occasional cattle grazing, mature pine selectively cut in about 1990
	No sign of fire, occasional cattle use (transitory - site adjacent to cow trail, but less grazing than site 3), no signs of recent harvest

Flying Squirrel Trap Sites, 2002-2003

Past Activity
No sign of fire, occasional cattle grazing, aspen clearcuts within 100 yds on both sides of aspen grove (1990)
No sign of fire. Cattle frequently present. Light thin within last 20 years
No sign of fire. Cattle use. Commercial thin within last 20 years
No old stumps, no fire scars

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Past Activity	
No old stumps, no fire scars	
No old stumps, no fire scars	
No recent signs of fire or timber harvest	
Recent thinning uphill	
None	
None	
Old horse-logging, nothing recent	

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Past Activity	
Thinning uphill, not within the last 20 years, no recent fire	
None evident	
Very old horse-log stumps, burned after cut	
Very old horse-log stumps, burned after cut	
Very old horse-log stumps, burned after cut	
None evident, very old fire	
None evident, very old fire	

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Flying Squirrel Trap Sites, 2002-2003

Past Activity
None evident, very old fire
None evident, no fire sign
None evident, very old fire, timber sale ~200' uphill
Very old stumps
Very old stumps
Thinned within past 20 years

BA=basal area, DBH=diameter, FDR=forest road, PP=ponderosa pine, TPA=trees per acre

Appendix E

Site Visits

Flying Squirrel Site Visits, 2002-2003

Location	Visit Number	Date	Time	Action	Wx	Squirrel
Bear Ridge Mid	1	11-Jun-2002	2000	Placed & set traps	Dry, 58°F	
Bear Ridge Mid	2	12-Jun-2002	0900	Set		
				Closed traps except #3	Clear most of the night but cloudy at 0730, humid, not much wind; 58°F	
Bear Ridge Mid	3	12-Jun-2002	0730	Set	Occasional clouds, windy 5-10 pm, low 70s	
Bear Ridge Mid	4	12-Jun-2002	1730	Set		
Bear Ridge Mid	5	23-Jun-2002		Set		
Bear Ridge Mid	6	24-Jun-2002		Wired open		
Bear Ridge Mid	7	25-Jun-2002		Set (with tuna for the first time)	Hot, dry, windy at night, calm otherwise	
Bear Ridge Mid	8	26-Jun-2002		Wired open, removed trap #3 (not working)	Very dry, no dew at 0700, low 60°F, high 88°F, 74°F at 0700	
Bear Ridge North	1	21-Jul-2002		Placed	Hot, dry, brief rain 7/24	
Bear Ridge North	2	25-Jul-2002		Baited	Brief rain & storm 7/26, 27	
Bear Ridge North	3	28-Jul-2002		Set		
Bear Ridge North	4	29-Jul-2002		Wired open	Clear, breezy, 65°F, no rain overnight, low ~50°F	
Bear Ridge North	5	29-Jul-2002	2000	Set		
Bear Ridge North	6	30-Jul-2002	0700	Wired open	Clear, calm, ~70°F at 0700, dry overnight	
Bear Ridge North	7	3-Aug-2003	1900	Removed traps	x	
Bear Ridge South	1	7-Jun-2002	2030	Placed traps at site A, set		
Bear Ridge South	2	8-Jun-2002	0700	Placed traps at sites B & C, baited all	Variably cloudy & windy overnight, wind strong at times	
Bear Ridge South	3	10-Jun-2002	2000	Set	Dry, 65°F	

Flying Squirrel Site Visits, 2002-2003

Location	Visit Number	Date	Time	Action	Wx	Squirrel
Bear Ridge South	4	11-Jun-2002	0730	Wired open	38°F, low 29°F, clear, light wind	
Bear Ridge South	5	11-Jun-2002	2000	Kept trap #2 in place, moved one, removed others to Bear Ridge	38°F at 0730, clear, no wind	
Bear Ridge South	6	12-Jun-2002	0900	Mid	Dry, 58°F	
Bear Ridge South	3	23-Jun-2002		Set		
Bear Ridge South	4	24-Jun-2002		Set		
Bear Ridge South	5	25-Jun-2002		Wired open		
Bear Ridge South	6	26-Jun-2002		Baited (using tuna for the first time)	Dry, very hot, windy overnight	
Bear Ridge Spur	1	2-Jun-2002	1300	Placed traps at sites A, B & C	80°F, clear, light wind - rained briefly but hard after the traps were placed	
Bear Ridge Spur	2	6-Jun-2002	2000	Removed trap #4, set others		
Bear Ridge Spur	3	7-Jun-2002	0700	Wired open	High 67°F, low 41°F, partly cloudy	
Bear Ridge Spur	4	7-Jun-2002	2000	Placed traps at sites D & E , set		
Bear Ridge Spur	5	8-Jun-2002	0700	Removed traps from site C (too visible)	Variably cloudy & windy overnight, wind strong at times	
Bear Ridge Spur	6	10-Jun-2002	2000	Removed trap from site D		
Big Hill Aspen (2002)	1	4-Aug-2002		Placed		
Big Hill Aspen (2002)	2	6-Aug-2002		Baited	Warm, a little rain 8/4-6	
Big Hill Aspen (2002)	3	9-Aug-2002	2000	Set		

Flying Squirrel Site Visits, 2002-2003

Location	Visit Number	Date	Time	Action	Wx	Squirrel
Big Hill Aspen (2002)	4	10-Aug-2002	0715		Mostly clear overnight, low ~60°F; morning clear, warm, fairly windy for so early	x
Big Hill Aspen (2002)	5	11-Aug-2002		Removed traps		
Big Hill Aspen (2003)	1	12-May-2003		Placed		
Big Hill Aspen (2003)	2	13-May-2003		Baited	Rain early	
Big Hill Aspen (2003)	3	17-May-2003	2000	Set		
Big Hill Aspen (2003)	4	18-May-2003	0700	Baited	May have rained overnight, low 49°F	
Big Hill Aspen (2003)	5	21-May-2003	2030	Set	Mostly clear, calm	
Big Hill Aspen (2003)	6	22-May-2003	0700	Baited	A little rain overnight	
Big Hill Aspen (2003)	7	27-May-2003	2100	Set		
Big Hill Aspen (2003)	8	28-May-2003	0600	Baited	Clear, dry overnight, heavy dew; high 67°F, low 42°F	
Big Hill Aspen (2003)	9	28-May-2003	1700	Set		
Big Hill Aspen (2003)	10	29-May-2003	0700	Wired open		
Big Hill Aspen (2003)	11	1-Jun-2003		Removed traps		
Big Hill Pine	1	11-Aug-2002		Placed		
Big Hill Pine	2	18-Aug-2002		Baited		
Big Hill Pine	3	21-Aug-2002		Set		
Big Hill Pine	4	22-Aug-2002		Removed traps	x	
Galena	1					
Galena	2	27-May-2003	1900	Baited		
Galena	3					
Galena	4	27-Jul-2003	1400	Placed	n/a	
Galena	5	29-Jul-2003	1900	Set	Hot, dry, clear	
Galena	6	30-Jul-2003	0700	Wired open	Warm, dry, clear	
Galena	7	2-Aug-2003	1900	Set	Hot, dry, clear	
Galena	8	3-Aug-2003	0900	Wired open	Warm, dew, clear	x

Flying Squirrel Site Visits, 2002-2003

Location	Visit Number	Date	Time	Action	Wx	Squirrel
Iron Creek	1	27-May-2002		Placed		
Iron Creek	2	30-May-2002	1830	Set	High mid-80s, dry, clear	
Iron Creek	3	31-May-2002	0745	Baited	Clear & dry overnight, low ~60°F	
Iron Creek	4	31-May-2002	1900	Set		
Iron Creek	5	1-Jun-2002	0700	Removed traps		
Keough (2002)	1	27-May-2002		Placed		
Keough (2002)	2	30-May-2002	1900	Set	High mid-80s, dry, clear	
Keough (2002)	3	31-May-2002	0645	Baited	Clear & dry overnight, low ~60°F	
Keough (2002)	4	31-May-2002	1830	Set A & B, placed C & D		
Keough (2002)	5	1-Jun-2002	0745	Removed traps		
Keough	1	14-Sep-2003		Placed	Cool, clear	
Keough	2	18-Sep-2003		Baited	Cold, snowed 3-4" 9/17/03	
Keough	3	22-Sep-2003	1700	Set	Warm (58°F), dry, clear	
Keough	4	23-Sep-2003	0700	Wired open or, if sprung, left sprung, removed trap w/mortality	Clear, no rain or snow, dew, low 35°F	
Keough	5	27-Sep-2003		Removed traps	x	
Timon	1	13-May-2003	2000	Placed traps 1, 2		
Timon	2	17-May-2003	1900	Set		
Timon	3	18-May-2003	0800	Baited	May have rained overnight	
Timon	4	21-May-2003	1930	Set	Mostly clear, 53°F, calm	

Flying Squirrel Site Visits, 2002-2003

Location	Visit Number	Date	Time	Action	WX	Squirrel
Timon	5	22-May-2003	0630	Baited	A little rain overnight, low 44°F	
Timon	6	1-Jun-2003		Placed traps 3, 4	Rain	
Timon	7	23-Aug-2003		Placed traps 5-10		
Timon	8	26-Aug-2003		Baited	Hot, dry	
Timon	9	31-Aug-2003	1930	Set	Cool, rained earlier and previous 2 days	
Timon	10	1-Sep-2003	0700	Baited	Clear, heavy dew, low 42°F	
Timon	11	6-Sep-2003	1900	Set	74°F	
Timon	12	7-Sep-2003	0700	Wired open or, if sprung, left sprung	Low 43°F	
Timon	13	14-Sep-2003		Removed traps		
Vanocker Ridge						
Vanocker Ridge	1	17-May-2003	1600	Placed	Cool, damp, cloudy	
Vanocker Ridge	2	20-May-2003	0700	Baited	Pleasant 5/20, but foggy, windy, snow squalls 5/18 & 19	
Vanocker Ridge	3	27-May-2003	1830	Baited		
Virk						
Virk	1	27-Apr-2003		Placed	Lots of rain previous week	
Virk	2	3-May-2003		Baited		

Set=Baited & set traps

Baited=Baited traps & wired open

Placed=Placed traps, baited, wired or set open.

Wired open=Just wired open.

Appendix F

Trapping Results

Flying Squirrel Trapping Results, 2002-2003

Location	Site	Trap	Visit Number	Date	Result
Bear Ridge Mid	A	1	2	12-Jun-2002	Bait intact
Bear Ridge Mid	B	2	2	12-Jun-2002	Bait intact
Bear Ridge Mid	C	3	2	12-Jun-2002	Bait intact
Bear Ridge Mid	D	4	2	12-Jun-2002	Bait intact
Bear Ridge Mid	A	1	4	12-Jun-2002	Bait intact
Bear Ridge Mid	B	2	4	12-Jun-2002	Bait intact
Bear Ridge Mid	C	3	4	12-Jun-2002	Bait intact
Bear Ridge Mid	D	4	4	12-Jun-2002	Bait intact, ants
Bear Ridge Mid	A	1	3	13-Jun-2002	Bait intact
Bear Ridge Mid	B	2	3	13-Jun-2002	Bait gone, sprung
Bear Ridge Mid	C	3	3	13-Jun-2002	Bait intact
Bear Ridge Mid	D	4	3	13-Jun-2002	Bait intact
Bear Ridge Mid	A	1	6	24-Jun-2002	Bait intact
Bear Ridge Mid	B	2	6	24-Jun-2002	Bait intact
Bear Ridge Mid	C	3	6	24-Jun-2002	Bait intact
Bear Ridge Mid	D	4	6	24-Jun-2002	Bait intact
Bear Ridge Mid	A	1	7	25-Jun-2002	Peanuts gone
Bear Ridge Mid	B	2	7	25-Jun-2002	Bait intact
Bear Ridge Mid	C	3	7	25-Jun-2002	Bait intact
Bear Ridge Mid	D	4	7	25-Jun-2002	Bait intact
Bear Ridge Mid	A	1	8	26-Jun-2002	Peanuts gone
Bear Ridge Mid	B	2	8	26-Jun-2002	Peanuts gone
Bear Ridge Mid	C	3	8	26-Jun-2002	Peanuts gone
Bear Ridge Mid	D	4	8	26-Jun-2002	Bait gone except tuna (chipmunk)
Bear Ridge North	A	1	2	25-Jul-2002	Bait gone
Bear Ridge North	A	2	2	25-Jul-2002	Bait gone
Bear Ridge North	B	3	2	25-Jul-2002	Bait gone
Bear Ridge North	B	4	2	25-Jul-2002	Bait gone
Bear Ridge North	C	5	2	25-Jul-2002	Bait gone
Bear Ridge North	C	6	2	25-Jul-2002	Bait gone
Bear Ridge North	A	1	3	28-Jul-2002	Bait gone
Bear Ridge North	A	2	3	28-Jul-2002	Bait gone
Bear Ridge North	B	3	3	28-Jul-2002	Bait gone
Bear Ridge North	B	4	3	28-Jul-2002	Bait gone

Flying Squirrel Trapping Results, 2002-2003

Location	Site	Trap	Visit Number	Date	Result
Bear Ridge North	C	5	3	28-Jul-2002	Bait gone except a bit of tuna
Bear Ridge North	C	6	3	28-Jul-2002	Bait gone
Bear Ridge North	A	1	4	29-Jul-2002	Red squirrel
Bear Ridge North	A	2	4	29-Jul-2002	Bait mostly gone, sprung
Bear Ridge North	B	3	4	29-Jul-2002	Bait intact
Bear Ridge North	B	4	4	29-Jul-2002	Peanuts & peanut butter gone, tuna intact with ants
Bear Ridge North	C	5	4	29-Jul-2002	Peanuts & peanut butter gone
Bear Ridge North	C	6	4	29-Jul-2002	Peanuts & peanut butter gone, sprung (watched chipmunks go in & out of trap, ignoring tuna)
Bear Ridge North	A	1	6	30-Jul-2002	Peanuts & peanut butter gone
Bear Ridge North	A	2	6	30-Jul-2002	Red squirrel
Bear Ridge North	B	3	6	30-Jul-2002	Flying squirrel adult (ate everything but Usnia)
Bear Ridge North	B	4	6	30-Jul-2002	Peanuts & peanut butter gone
Bear Ridge North	C	5	6	30-Jul-2002	Bait gone, including Usnia
Bear Ridge North	C	6	6	30-Jul-2002	Bait gone, Usnia intact, sprung
Bear Ridge South	A	1	2	8-Jun-2002	Bait intact
Bear Ridge South	A	2	2	8-Jun-2002	Bait intact
Bear Ridge South	A	1	3	10-Jun-2002	Bait intact
Bear Ridge South	A	2	3	10-Jun-2002	Bait gone
Bear Ridge South	B	3	3	10-Jun-2002	Bait partly gone
Bear Ridge South	B	4	3	10-Jun-2002	Bait partly gone
Bear Ridge South	C	5	3	10-Jun-2002	Bait intact
Bear Ridge South	A	1	4	11-Jun-2002	Bait intact
Bear Ridge South	A	2	4	11-Jun-2002	Bait intact
Bear Ridge South	B	3	4	11-Jun-2002	Bait intact
Bear Ridge South	B	4	4	11-Jun-2002	Bait intact

Flying Squirrel Trapping Results, 2002-2003

Location	Site	Trap	Visit Number	Date	Result
Bear Ridge South	C	5	4	11-Jun-2002	Bait intact
Bear Ridge South	A	1	6	12-Jun-2002	Bait intact
Bear Ridge South	A	2	6	12-Jun-2002	Peanuts gone (chipmunk)
Bear Ridge South	A	1	7	12-Jun-2002	Peanuts gone
Bear Ridge South	A	2	7	12-Jun-2002	Peanuts gone
Bear Ridge South	A	1	8	13-Jun-2002	Bait intact
Bear Ridge South	A	2	8	13-Jun-2002	Peanuts gone, sprung (chipmunk in & out of trap)
Bear Ridge South	A	1	4	24-Jun-2002	Bait intact
Bear Ridge South	A	2	4	24-Jun-2002	Bait intact
Bear Ridge South	B	3	4	24-Jun-2002	Bait intact
Bear Ridge South	B	4	4	24-Jun-2002	Bait intact
Bear Ridge South	C	5	4	24-Jun-2002	Bait intact
Bear Ridge South	A	1	5	25-Jun-2002	Peanuts gone
Bear Ridge South	A	2	5	25-Jun-2002	Bait intact
Bear Ridge South	B	3	5	25-Jun-2002	Bait intact
Bear Ridge South	B	4	5	25-Jun-2002	Bait intact
Bear Ridge South	C	5	5	25-Jun-2002	Bait intact
Bear Ridge Spur	A	1	2	6-Jun-2002	Bait intact
Bear Ridge Spur	B	2	2	6-Jun-2002	Bait intact
Bear Ridge Spur	C	3	2	6-Jun-2002	Bait gone
Bear Ridge Spur	C	4	2	6-Jun-2002	Bait gone
Bear Ridge Spur	C	5	2	6-Jun-2002	Bait gone
Bear Ridge Spur	A	1	3	7-Jun-2002	Bait intact
Bear Ridge Spur	B	2	3	7-Jun-2002	Bait intact
Bear Ridge Spur	C	3	3	7-Jun-2002	Bait intact
Bear Ridge Spur	C	5	3	7-Jun-2002	Bait intact
Bear Ridge Spur	A	1	4	8-Jun-2002	Bait intact
Bear Ridge Spur	B	2	4	8-Jun-2002	Bait intact
Bear Ridge Spur	C	3	4	8-Jun-2002	Bait intact
Bear Ridge Spur	C	5	4	8-Jun-2002	Bait intact
Bear Ridge Spur	D	1	4	8-Jun-2002	Bait intact
Big Hill Aspen (2002)	A	1	2	6-Aug-2002	Bait gone
Big Hill Aspen (2002)	A	2	2	6-Aug-2002	Bait gone

Flying Squirrel Trapping Results, 2002-2003

Location	Site	Trap	Visit Number	Date	Result
Big Hill Aspen (2002)	B		3	2	6-Aug-2002 Bait intact
Big Hill Aspen (2002)	B		4	2	6-Aug-2002 Peanuts gone
Big Hill Aspen (2002)	C		5	2	Peanuts gone from outside trap, bait inside trap intact
Big Hill Aspen (2002)	C		6	2	Peanuts gone
Big Hill Aspen (2002)	A		1	4	Flying squirrel, probably adult (by size), went up trap tree
Big Hill Aspen (2002)	A		2	4	Flying squirrel, probably adult (by size), went up trap tree
Big Hill Aspen (2002)	B		3	4	Flying squirrel, probably adult (by size), went up aspen and froze
Big Hill Aspen (2002)	B		4	4	Bait intact (bait outside trap gone)
Big Hill Aspen (2002)	C		5	4	Flying squirrel, probably juvenile (by size), went up aspen tree to cavity; damp from dew but evidently ok
Big Hill Aspen (2002)	C		6	4	Flying squirrel, probably juvenile (by size), went up aspen tree & froze; damp from dew but evidently ok
Big Hill Aspen	A		1	4	18-May-2003 Bait intact
Big Hill Aspen	A		1	5	21-May-2003 Bait gone
Big Hill Aspen	A		1	6	22-May-2003 Bait intact
Big Hill Aspen	A		1	7	27-May-2003
Big Hill Aspen	A				Bait intact except for peanuts & tuna left on branch outside
Big Hill Aspen	A		1	8	28-May-2003 trap
Big Hill Aspen	A		1	9	28-May-2003 Ants
Big Hill Aspen	A		1	10	29-May-2003 Bait intact
Big Hill Aspen	A		1	11	1-Jun-2003 Bait gone
Big Hill Aspen	A		2	4	18-May-2003 Bait intact

Flying Squirrel Trapping Results, 2002-2003

Location	Site	Trap	Visit Number	Date	Result
Big Hill Aspen	A	2	5	21-May-2003	Bait gone
Big Hill Aspen	A	2	6	22-May-2003	Bait intact
Big Hill Aspen	A	2	7	27-May-2003	
Big Hill Aspen	A	2	8	28-May-2003	Bait intact
Big Hill Aspen	A	2	9	28-May-2003	Tuna gone
Big Hill Aspen	A	2	10	29-May-2003	Long-tailed vole
Big Hill Aspen	A	2	11	1-Jun-2003	Bait gone
Big Hill Pine	A	1	4	22-Aug-2002	
Big Hill Pine	A	2	4	22-Aug-2002	
Big Hill Pine	B	3	4	22-Aug-2002	
Big Hill Pine	B	4	4	22-Aug-2002	Flying squirrel, evidently adult
Big Hill Pine	C	5	4	22-Aug-2002	
Big Hill Pine	C	6	4	22-Aug-2002	Flying squirrel, evidently adult
Galena	A	1	6	30-Jul-2003	Bait intact
Galena	A	1	8	3-Aug-2003	Sprung, tuna gone
Galena	A	2	6	30-Jul-2003	Ants eating tuna
Galena	A	2	8	3-Aug-2003	Open, tuna gone
Galena	B	5	6	30-Jul-2003	Ants
Galena	B	5	8	3-Aug-2003	Flying squirrel, appears to be juvenile, wet. (climbed up spruce & jumped to aspen snag)
Galena	B	6	6	30-Jul-2003	Ants
Galena	B	6	8	3-Aug-2003	Sprung, ants
Galena	C	3	6	30-Jul-2003	Ants
Galena	C	3	8	3-Aug-2003	Gray jay
Galena	C	4	6	30-Jul-2003	Ants
Galena	C	4	8	3-Aug-2003	Sprung, ants
Iron Creek	A	1	2	30-May-2002	Bait gone
Iron Creek	A	2	2	30-May-2002	Bait gone
Iron Creek	A	1	3	31-May-2002	Bait intact

Flying Squirrel Trapping Results, 2002-2003

Location	Site	Trap	Visit Number	Date	Result
	A	2	3	31-May-2002	Bait intact
Iron Creek	A				Sprung, trigger wire very bent, full of needles & duff, droppings, blood, back door bent enough to create ~1.5" hole
Iron Creek	A	1	5	1-Jun-2002	Bait intact, sprung
Keough (2002)	A	1	2	30-May-2002	Bait gone
Keough (2002)	B	1	2	30-May-2002	Bait gone
Keough (2002)	A	1	3	31-May-2002	Bait intact
Keough (2002)	B	1	3	31-May-2002	Bait intact
Keough (2002)	A	1	5	1-Jun-2002	Bait intact
Keough (2002)	B	1	5	1-Jun-2002	Bait gone, sprung
Keough (2002)	C	1	5	1-Jun-2002	Bait intact
Keough (2002)	D	1	5	1-Jun-2002	Bait intact
Keough	A	1	2	18-Sep-2003	Bait gone
Keough	A	2	2	18-Sep-2003	Bait gone
Keough	B	3	2	18-Sep-2003	Bait gone
Keough	B	4	2	18-Sep-2003	Bait gone
Keough	C	5	2	18-Sep-2003	Bait intact
Keough	C	6	2	18-Sep-2003	Bait gone
Keough	D	7	2	18-Sep-2003	Bait gone
Keough	D	8	2	18-Sep-2003	Bait gone
Keough	E	9	2	18-Sep-2003	Bait gone
Keough	E	10	2	18-Sep-2003	Bait gone
Keough	A	1	3	22-Sep-2003	bark over (stiff)
Keough	A	2	3	22-Sep-2003	Bait gone (snaps ok)
Keough	B	3	3	22-Sep-2003	Bait gone (snaps ok)
Keough	B	4	3	22-Sep-2003	Bait gone (stiff)
Keough	C	5	3	22-Sep-2003	Bait gone, Usnia gone
Keough	C	6	3	22-Sep-2003	Bait gone, Usnia intact
Keough	D	7	3	22-Sep-2003	Bait gone, Usnia intact
Keough	D	8	3	22-Sep-2003	Bait gone (snaps ok)

Flying Squirrel Trapping Results, 2002-2003

Location	Site	Trap	Visit Number	Date	Result
Keough	E	9	3	22-Sep-2003	Bait gone (snaps ok)
Keough	E	10	3	22-Sep-2003	Bait gone, Usnia gone (snaps ok)
Keough	A	1	4	23-Sep-2003	Bait intact
Keough	A	2	4	23-Sep-2003	Bait intact, sprung
Keough	B	3	4	23-Sep-2003	Bait intact
Keough	B	4	4	23-Sep-2003	Bait intact
Keough	C	5	4	23-Sep-2003	Peanut butter gone, sprung
Keough	C	6	4	23-Sep-2003	Flying squirrel, adult
Keough	D	7	4	23-Sep-2003	Flying squirrel, adult Adult & juvenile flying squirrels - juvenile dead, adult expired soon after
Keough	D	8	4	23-Sep-2003	being released
Keough	E	9	4	23-Sep-2003	Bait intact
Keough	E	10	4	23-Sep-2003	Bait intact
Timon	A	1	2	17-May-2003	Tuna gone
Timon	A	1	3	18-May-2003	Bait intact
Timon	A	1	4	21-May-2003	Bait intact
Timon	A	1	5	22-May-2003	Bait intact
Timon	A	2	2	17-May-2003	Peanut butter gone
Timon	A	2	3	18-May-2003	Bait intact
Timon	A	2	4	21-May-2003	A few peanuts gone
Timon	A	2	5	22-May-2003	Bait intact
Timon	A	1	8	26-Aug-2003	Bait gone
Timon	A	2	8	26-Aug-2003	Bait gone
Timon	B	3	8	26-Aug-2003	Bait gone
Timon	B	4	8	26-Aug-2003	Bait gone
Timon	C	5	8	26-Aug-2003	Bait gone
Timon	C	6	8	26-Aug-2003	Bait gone
Timon	D	7	8	26-Aug-2003	Bait gone
Timon	D	8	8	26-Aug-2003	Bait gone
Timon	E	9	8	26-Aug-2003	Bait gone
Timon	E	10	8	26-Aug-2003	Bait gone
Timon	A	1	9	1-Sep-2003	Bait intact

Flying Squirrel Trapping Results, 2002-2003

Location	Site	Trap	Visit Number	Date	Result
Timon	A	2	9	1-Sep-2003	Bait intact
Timon	B	3	9	1-Sep-2003	Forgot to set (peanut butter gone)
Timon	B	4	9	1-Sep-2003	Open, peanut butter gone (needs oil)
Timon	C	5	9	1-Sep-2003	Bait intact
Timon	C	6	9	1-Sep-2003	Peanut butter gone, sprung Flying squirrel, appears to be an adult
Timon	D	7	9	1-Sep-2003	Peanut butter gone
Timon	D	8	9	1-Sep-2003	Peanut butter gone
Timon	E	9	9	1-Sep-2003	Bait intact
Timon	E	10	9	1-Sep-2003	Bait intact, sprung
Timon	A	1	11	6-Sep-2003	Bait gone
Timon	A	2	11	6-Sep-2003	Bait gone
					Bait gone, trap tipped sideways like something was trying to get at the bait under the trap
Timon	B	3	11	6-Sep-2003	Bait gone
Timon	B	4	11	6-Sep-2003	Bait gone
Timon	C	5	11	6-Sep-2003	Bait gone
Timon	C	6	11	6-Sep-2003	Bait gone
Timon	D	7	11	6-Sep-2003	Bait gone
Timon	D	8	11	6-Sep-2003	Bait gone
Timon	E	9	11	6-Sep-2003	Bait gone
Timon	E	10	11	6-Sep-2003	Bait gone
					Bait intact (trap in spruce tree, lots of red squirrels cutting cones)
Timon	A	1	12	7-Sep-2003	Bait intact
Timon	A	2	12	7-Sep-2003	Flying squirrel - possibly juvenile, smaller than the 9/1/03 trap #7 squirrel
Timon	B	3	12	7-Sep-2003	Bait intact
Timon	B	4	12	7-Sep-2003	Bait gone (trap ornery, hard to spring)
Timon	C	5	12	7-Sep-2003	Bait mostly gone, sprung
Timon	C	6	12	7-Sep-2003	

Flying Squirrel Trapping Results, 2002-2003

Location	Site	Trap	Visit Number	Date	Result
Timon	D	7	12	7-Sep-2003	Flying squirrel - same as last time? Big. Climbed snag & flew 100' downhill to pine
Timon	D	8	12	7-Sep-2003	Bait intact, sprung; red squirrels in immediate vicinity
Timon	E	9	12	7-Sep-2003	Bait intact
Timon	E	10	12	7-Sep-2003	Peanut butter gone, sprung
Vanocker Ridge	A	7	2	20-May-2003	Bait intact
Vanocker Ridge	A	7	3	27-May-2003	Bait intact
Vanocker Ridge	A	8	2	20-May-2003	Peanuts gone
Vanocker Ridge	A	8	3	27-May-2003	Bait gone
Vanocker Ridge	B	5	2	20-May-2003	Bait gone
Vanocker Ridge	B	6	2	20-May-2003	Peanuts & peanut butter gone
Vanocker Ridge	B	9	2	20-May-2003	Bait intact
Vanocker Ridge	B	10	2	20-May-2003	Peanuts & peanut butter gone
Virk	A	1	2	3-May-2003	Bait intact
Virk	A	2	2	3-May-2003	Bait gone
Virk	B	3	2	3-May-2003	Bait intact
Virk	B	4	2	3-May-2003	Bait intact
Virk	C	5	2	3-May-2003	Trap gone
"Bait intact" assumes trap is open.					

Appendix G

Other Reports of Flying Squirrels in the Northern Black Hills

These observations were reported to the author by acquaintances and U.S. Forest Service employees. All took place between 1990 and 2003.

Location	Notes
Bear Ridge Spur site	Observation occurred before timber harvest
Sand Creek (south of Beulah, Wyoming)	At night in low-elevation bur oak stand
Pole Cabin Gulch (southwest of Sundance, Wyoming)	At night in mixed pine/birch/aspen
Big Hill Aspen site	Observed leaving aspen cavity as tree was cut
West of Custer, South Dakota	Observed leaving old pine snag pushed over in winter
Hospital Gulch (south of Beulah, Wyoming)	Flew across trail in daylight